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The Farmer's Digest

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Improve Your Soil with Organic Materials

Condensed from Eastern States Cooperator

Rodger C. Smith

FREQUENT additions of organic material to soils make them alive, dynamic and fit for high production. Soil organic matter affects soil supplies of moisture, air and available nutrients for plant growth.

Most soil organic matter used in farming consists of decomposing vegetable material which originally came from living plants. Even farm manures are roughage and grain concentrates which have only partly decomposed in the digestive systems of animals. Sods, green manure crops, crop residues and mulching materials are also sources of organic matter which are decomposed by soil organisms, most of which work best in the presence of air and adequate supplies of moisture and available nutrients, especially nitrogen, calcium and phosphorus.

As organic materials decompose, they release the nutrients which the plants draw from the soil upon which they grow. Thus, those who purchase grain and hay, bring to their farms some of the nutrients from the farms where their purchased feed was grown. These nutrients are needed by growing crops in varying amounts during the growing season. In general, the largest amounts of nutrients are necessary when moisture is abundant and temperature high, causing rapid crop growth. It is undoubtedly part of nature's plan that adequate moisture and high temperature increase the decay of organic matter. With this decay, plant nutrients tend to become available in relation to the needs of growing crops, provided there is enough organic matter.

Soils vary in the type of organic materials required. Crops vary considerably in the types of organic matter they produce and it is therefore essential to be selective in the type of crop used for adding to different kinds of soils. Heavy soils require coarse, fibrous material which will sep-

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arate the soil particles. These soils also require cover or sod crops with a deep, coarse root system to penetrate below plow depth in order to increase aeration and water penetration. Sandy soils require rather fine rooted and fine textured crops which, in a sense, tend to bind the light, sandy soil together. Mulch, such as hay or sawdust, is adaptable to both heavy and light soils.

Fresh green organic materials from immature plants are of more value in a sandy soil than in a heavy one.

Some of the cover crops especially suitable for improving light, sandy soils are: ryegrass—late August seeding; ryegrass and mammoth red clover; ryegrass and crimson clover for summer annual in northern Maine and winter cover in Delaware, Maryland and southern Pennsylvania: rye—September or October seeding; oats; vetch—with ryegrass, wheat or rye. A sod crop similarly useful on light soils is red top.

Fibrous types of organic materials from mature plants are of more value in a heavy soil than in a sandy one.

Some of the crops and residues especially suitable for improving heavy soils are: cover crops of millet or sweet clover on well drained soils; crops of alfalfa on well drained soils; and crops such as corn stover, straw, and manure containing straw, shavings or sawdust.

Soil organic matter is of more value to improve physical condition in the lighter and heavier soils than in medium textured loamy soils.

Additions of organic materials to the soil do considerably more than improve its physical condition. When these materials are decomposed, soil organic matter remains which has beneficial effects on the soil.

Here it serves as a storehouse of nitrogen and other plant nutrients. The total nitrogen content of soils can be raised only by raising the organic matter content because nitrogen is not contained in soil minerals. As the process of accumulating organic matter progresses, the soil structure is improved; the soil particles are separated giving fluffiness to the soil. On heavy clay soils, soil particles are brought together to form stable granules. Air and water movement within the soil is thereby improved. Rainfall absorption is increased.

The sod or cover crops used as sources of organic matter reduce surface erosion which is a loss of the fertile fine particles of the soil and organic matter.

Nitrogen and other plant nutrients of the crop residues remaining in the soil after harvesting of row crops are partially used in the growth of cover crops.

These fertilizer nutrients are kept from leaching and are stored in the cover crop in a form which will later be available for fertilizing plants. The so-called minor elements are also kept in a more available form.

Both the quantity and the quality of organic materials in the soil are important to good productivity.

Soils vary widely in the quantity of organic matter which they contain. The soils of our cool climate have relatively more organic matter than the soils of the southern states. The light soils along our Atlantic Coast have less than heavier inland soils. In the North-Eastern States, the organic matter in cultivated sandy soils is generally one or two percent, in loams, two to four and in clay soils three to five. Similar soils in permanent sod or long rotation contain somewhat higher percentages of organic matter. Our job is not so much that of raising the level of organic matter in our soils, but more that of making regular additions of fresh readily decomposable organic materials so as to maintain an adequate reserve of plant nutrients.

On a dairy farm, the quantity of soil organic matter is often adequate, due to most of the land being in sod and to the return of animal manure to the land. It is usually not adequate where there are small grains and corn in a rotation and especially on vegetable farms. On the latter, full regard must be given to sources of organic matter in order to make additions regularly and in turn maintain high crop yields. Appreciable additions or maintenance of nitrogen can be economically accomplished only through organic-building crops. Of the total nitrogen in the soil 98 to 99 percent is in organic form.

There is often an opportunity for improvement in quality of sods to plow down prior to planting row crops. Prime factor of quality is the amount of nitrogen contained. In order to supply nitrates to the growing crop, organic matter must contain about two percent nitrogen; otherwise decomposition will be slow and the growing crop limited in nitrogen. Where straw or other heavy non-leguminous crops have been plowed down without added nitrogen, numerous observations have been made of decreased yield of the crop following. When plowing down non-legume sods or heavy cover crops in advance of row crops, it is well to apply before plowing a nitrogen material or a mixed fertilizer containing nitrogen. The amount of nitrogen to be applied depends upon the quantity and nitrogen content of organic matter added. If the organic matter added contains one percent nitrogen (20 pounds per ton), an additional 20 pounds

per ton should be applied so as to bring the total up to two percent (40 pounds per ton).

Most of the grasses harvested near maturity and straw of small grains require the addition of at least 20 pounds of nitrogen to each ton of crop on a dry basis. One and one-half to two tons of these crops will benefit by 100 pounds of ammonium nitrate or the equivalent of some other nitrogen material, or, 300 pounds of 10–10–10 per acre being plowed down with the crop. Corn stover contains less nitrogen than most grasses and requires about 300 pounds of ammonium nitrate or the equivalent per acre for decomposition. The legumes generally contain sufficient nitrogen to meet their needs of decomposition.

Row cropping offers conditions most difficult for maintenance of an adequate organic matter level in the soil. Use of cover crops seeded at last cultivation or after harvest can do considerable to provide regular additions to the soil. More economical production of crops frequently results from not only the use of winter cover crops, but rotating vegetables with sod on market garden land such as sod one year in three or four years. Whenever sods can be left for two or more years, the organic material produced in a thrifty growing sod is proportionately greater than from a one-year sod.

On general farms producing primarily roughage crops and grains, crop yields are more likely to be limited by the supply of nitrogen at some critical period than by any other plant nutrient. The most important effect of a crop on the crop which follows in the rotation is its effect on the available nitrogen supply of the soil. The position in the rotation following the hay crop is usually regarded as the most favorable position in the rotation. Clover and timothy sods, which are most common, are usually left down for more than two years, resulting in a timothy sod with considerable weeds to precede the valuable cultivated crop in the rotation. Low yields of corn or other crops following such timothy sods are related to the low available nitrogen content of the soil after such sods are plowed down.

For high per-acre yields, every effort should be made to have legumes in the sod to plow down instead of a grass sod. Where satisfactory stands of perennial legumes, like alfalfa or ladino clover, can be maintained, such mixtures can well be used. If short-lived legumes such as red clover are used, the plowing of the sod should be done before the legumes die out. If grass sods must be used, much better results will be secured if the grass sod is kept

thrifty by proper fertilization up to the time it is plowed down and the following crop receives a fertilizer containing nitrogen. Such an adjustment will usually result in higher average yields of hay. Better quality hay, high content of protein, calcium, phosphorus and other minerals and higher yields of other crops in the rotation are also to be expected.

Stable and poultry manures are a very important source of organic matter and plant food. Effective measures of conservation of the manure and practical rates of application are important to the economy on our northeastern farms. These measures become particularly important as the fertility of soils is raised. With more productive soils, the level of nitrogen and minerals in the roughage is raised. The manure from the herd, therefore, contains more plant food much of which is in the liquid portion.

It is important to get this liquid back into the soil rather than dribble it along roadways if the productivity of the soil is to be maintained.

Apply stable manure at five to 10 tons per acre; poultry manure at four to five tons per acre. Get over the farm more frequently. On new hayland or pasture seedings apply five tons manure to form a mulch on the surface, thereby reducing erosion, causing less drying and crusting of the soil surface, and providing some plant nutrients to the new seedlings. There is also some protection against winter injury and heaving. This suggestion does not apply to seedings with small grains on fertile fields where the grain crop is likely to lodge.

The manure spreader can be a fertilizer spreader for sod crops particularly. For hay fields which contain mostly grasses, add to fresh stable manure high in straw or litter at least 10 pounds of ammonium nitrate per load (or equivalent of other nitrogen material) and 30 pounds of 20% superphosphate to balance the fertilizer more nearly to a 1–1–1 ratio and to provide enough nitrogen for decomposition of organic materials.

For clover fields where a light topdressing of manure can be used for winter protection, additional potash (10 pounds per ton) should be used with phosphated manure, or 30 pounds of 0–20–20 per load of manure if superphosphate has not been used in the gutter. Phosphate, potash and borax seem to be more effective when applied with manure.

Poultry manures are particularly productive on sand soils which respond well to nitrogen.

To save the nitrogen in poultry manure, use heavy rates of superphosphate and a "build-up" type of litter; an average of two to four pounds of 20% superphos-

phate per day for each 100 hens or 50 pounds of 20% superphosphate per spreader load. Poultry manure is lower in potash than either nitrogen or phosphate. For vegetables or leguminous sods, application of fertilizers high in potash as a supplement to poultry manure is necessary in order to maintain balanced soil productivity. The potash can be provided by the placement of fertilizer such as 0–20–20 or 8–16–16 on the spreader load or directly used on the land according to the crop and time of spreading manure. Grades containing potash, such as 0–20–20, can be substituted for superphosphate on the spreader load but do not apply these grades to the litter in the houses because the potash prevents drying out of the litter.

Hydrated lime is excellent for conserving the nitrogen in poultry manure, although it does not balance up the phosphate and potash. Apply to the litter 100 pounds of hydrated lime per 100 birds every two weeks. Apply to the droppings pits or droppings boards 10 pounds of hydrated lime per 100 mature birds every week. During periods of the year when not concerned with moisture in the litter, the rate of application to the litter can be reduced.

Important Aspects of Swine Nutrition

Condensed from the Hog Breeder

Dr. J. A. Hoefer
Purdue University

FEEDING livestock is just about the biggest job the Indiana farmer has, as indicated by the fact that from 70 to 75 cents of every dollar he receives comes from the sale of livestock and livestock products. More specifically we might point out that the nutrition of the pig assumes great significance when we observe that almost half of this livestock income comes from the sale of market hogs, or from 30 to 35 cents of every dollar income the farmer receives.

In 1947 Indiana farmers raised 6,584,000 pigs, about 53% of which were spring pigs and 47% fall pigs. Indiana ranks third in the nation in the production of

Reprinted by permission from the Hog Breeder, Chicago, Illinois, July, 1948

hogs, being surpassed only by Iowa and Illinois.

Now let us make several assumptions and consider how these hogs might be fed in order to take them from weaning to a market weight of approximately 225 pounds, which is a better market weight than the 250 to 300 pounders that we see all too frequently on our markets. It has been well established in numerous experiments that when corn alone is fed, it takes approximately 12 bushels of corn to make 100 pounds of gain on a fattening hog. This would mean about 24 bushels of corn to make a market hog out of a weanling pig. It has also been equally well established that under excellent feeding and management a hundred pounds of gain can be produced from 5 to 6 bushels of corn plus 40 to 50 pounds of the right kind of supplement, or approximately 11 bushels of corn plus 100 pounds of supplement to produce a market hog of 225 pounds.

Great savings can be made by proper feeding, and there is plenty of evidence to indicate that we could do a better job of feeding hogs. It has been reliably reported that less than 50% of our swine and poultry are fed balanced rations. We should increase our efforts to bring about improvement on the part of the inefficient feeders. It is tragic at this time to waste feed by feeding unbalanced rations or by feeding animals to excessively heavy weights.

Before we consider the nutrition of the hog in more detail it might be well to consider certain fundamental facts which influence swine feeding. Corn and hogs and therefore concentrates and hogs are inseparable. A map of the corn belt and a map showing swine population are practically identical. Corn and total concentrates make up about 80% and 95% respectively of the fattening hog's ration. The need for a swine supplement then is based logically on the need to make up or supplement the deficiencies of corn, and any supplement which fails to take this into account is an inefficient one. The deficiencies of corn are of course protein, both quantity and quality, minerals and vitamins.

It should also be recognized that the hog being monogastric has a protein and vitamin requirement which differs greatly from that of the ruminant, which has a fermentation vat to supplement its dietary protein and vitamin supply. For efficient results the hog must be fed protein of high quality, that is protein which supplies the right kind of amino acids in adequate amounts and in proper balance with one another. Which of the 22 or 23 amino acids are essential for swine? We don't know yet, but we think the requirements are

qualitatively similar to those of the rat and of poultry. We are making progress in this direction and we hope that in the not too far distant future we will be able to state first qualitatively, and then quantitatively the amino acid requirements of swine. When that day arrives much of the guess work in meeting protein requirements of swine will be eliminated.

In common with most other animals swine require the fat-soluble vitamins A and D. Vitamin E is also required but the amounts are unknown. It is not likely to be deficient however because this vitamin has a wide distribution, being found in most of our common feedstuffs. With regard to the so-called B-complex vitamins the story is a little different. Many micro-organisms have the ability to synthesize the B-vitamins, but in the case of swine the amount of effective synthesis which takes place in the digestive tract is very limited. By using synthetic diets it has been demonstrated that the following B-vitamins are required by swine: thiamin, riboflavin, niacin, pantothenic acid, pyridoxine, chlorine, biotin, inositol, and folic acid. Of these it would appear that riboflavin, niacin, pantothenic acid and chlorine are of the greatest practical importance.

With regard to the mineral needs of swine, it should be borne in mind that when the bulk of the ration is corn, or other materials of plant origin the chief deficiencies are calcium and salt. Corn is notoriously low in calcium and only fair in its phosphorus content; the plant protein supplements are also low in calcium but are good sources of phosphorus. The results obtained in recent experiments at Purdue with reference to salt feeding are striking testimony to the important role played by this simple mineral. Salt feeding is frequently neglected because it is very common opinion that while salt is essential for cattle and sheep it may be omitted from the swine ration. Scientific research has established that there are at least thirteen essential mineral elements, but that doesn't mean that all thirteen need to be included in the mineral supplement. The evidence available today would indicate that the following elements may be of practical concern to the Indiana swine producer: calcium, phosphorus, sodium, chlorine, iodine and iron. The first five can be easily supplied by a simple mineral mixture which includes stabilized iodized salt. Iron and copper deficiencies are limited to suckling pigs kept indoors and can be prevented very effectively by placing uncontaminated sod or dirt in the pen or by applying a solution of ferrous or iron sulphate (copperas) to the sow's udder daily. The other essential mineral elements are usually sup-

plied in adequate amounts by the rest of the ration and there is no justification for including all of them in a general purpose mineral supplement.

The problem of swine feeding is no longer simple but complex. The answer depends upon the existing conditions, and these must be considered when formulating the ration. The major conditions may be listed as follows:

1. Dry lot
2. Pasture
3. Gestation
4. Lactation
5. Weaning to 75 pounds
6. 75 pounds to market weight

Most researchers are pretty well agreed now that the most critical feeding conditions or periods are gestation, lactation, weaning to 75 pounds in weight, and dry lot. Our feeding problems are usually well taken care of when our hogs are on good pasture or have reached approximately 75 to 100 pounds in weight in a thrifty condition. To the workers at the Illinois Experiment Station must go much of the credit for studying the critical requirements for reproduction and early growth. The Ilinois workers and investigators at other stations have found that during these periods of greatest nutritional strain, such as dry lot, during gestation, and early growth, certain adjustments must be made in the ration if optimum performance is to be attained. The literature contains many reports of the importance of including some animal protein and a fairly high percentage of high quality alfalfa meal (10 to 15% for reproduction) in the ration. Apparently the problem is not simply one of amino acid balance or quality of protein but is more likely related to the water-soluble vitamins and possibly some unidentified factors. Feeds other than alfalfa which are known to have protective functions during these critical periods are distillers' solubles, condensed fish solubles and liver. These feeds and others are being subjected to much intensive and critical research in an effort to discover what nutritional factors they contain that seem to be so essential for normal reproduction and early growth.

The most practical and effective recommendation that can be made for feeding breeding hogs is to make maximum use of good green pasture. Good pasture will correct a multitude of dry-lot feeding sins. I think that in the past we have underestimated the grazing ability of the brood sow. We should intensify our efforts toward developing improved hog pastures and increasing the length of the grazing season. Success along this line would result in a marked decrease in the present 30 to 40 percent pig mortality. One should not lose sight of the fact that every pig lost at farrowing repre-

sents 100 to 150 pounds of feed. Also if we raise one more pig per litter over the average (6 for the country) we literally double our opportunity for profit.

Pastures can be used to a definite advantage for fattening hogs as well as breeding hogs. Numerous experiments have shown that good pasture will save from 10–15 percent of the concentrates and up to 50 percent of the protein supplement.

When pastures are not available because of the season or when the program calls for the production of hogs under dry lot conditions, the feeder needs to pay particular attention to his ration. The gestation ration should contain at least 10 to 15 percent alfalfa, a protein supplement including some animal protein, and adequate mineral, especially calcium, phosphorus and iodized salt. According to the recommendations of the National Research Council's Committee on Swine Nutrition, such a ration should contain 15 percent crude protein, .60 percent calcium and .40 percent phosphorus.

How much alfalfa should be fed to growing and fattening hogs in dry lots depends partly on price relationships. Probably not less than 5 percent and not over 15 percent should be fed. Some experiments have shown that at the 10 percent level the rate of gain is not greatly affected and under some conditions the gain may be produced at less cost. The ration of the 100 pound growing fattening pig should contain 16 percent crude protein.

The National Research Council Sub-Committee on Swine Nutrition has summarized in so far as reliable data were available, the quantitative requirements of the various classes of swine for a good many nutrients.

The Purdue Station has just started an experiment in which certain pasture comparisons will be made: alfalfa and ladino mixture with and without protein supplements, and oats and rape plus sudan as compared with straight alfalfa through the fattening period. The project on "Death Losses in Newborn Pigs" is being continued. The Animal Husbandry and Agricultural Chemistry Departments are cooperating on a very interesting project in which they are studying the amino acid requirements of the growing pig. To date they have established that tryptophane and lysine are essential. Synthetic diets are being used in this experiment as well as in one in which fat requirements are being studied. We have in progress several feeding trials in which liquid fish and condensed fish solubles are being compared with standard supplements. A number of trials have been carried out in which the

objectives were to study the effects of feeding various drugs which affect the thyroid gland and its functions. Some very interesting but as yet not final and conclusive results have been obtained to date. In addition to the above we expect to initiate this fall a project in which we will study the biological value of the protein of various corn products, such as corn germ, steep water solubles, etc. We plan to use synthetic basal diets and feed pigs individually in this study.

The projects mentioned represent a part of Purdue's interest in swine nutrition and in solving some of these problems we hope to contribute to a successful swine industry which is fundamental to the welfare of Indiana's agriculture. The commercial feed industry can also contribute in a very significant way toward a better livestock program by making available to the farmer supplements which are properly balanced so as to make up the deficiencies of the farmer's homegrown feed supply. I see no reason for selling him something which he already has or can produce economically, or something which he doesn't need, such as tonic feeds, cure-alls etc. The feed dealer has a wonderful opportunity to improve feeding practices on the farm by offering sound advice to the farmer on the numerous occasions they meet. How successful the commercial feed industry has been in the conduct of its business can be measured in part by the success of the Indiana Swine producer.

Mulch Culture Shows Promise

Condensed from The Southern Planter

Wilbert Schaal
Virginia Agricultural Experiment Station

MULCH culture, as a way to prepare a seedbed by leaving part of the cover crop on the top of the ground to break the impact of falling raindrops, is like a hot political issue. It has been tossed and buffeted back and forth throughout the country, first one way and then another, by individuals who can't decide whether mulch culture is a good thing for our land, or a bad one.

Reprinted by Permission from the Southern Planter, Governor Street, Richmond, Virginia, June, 1948

Some theorists claim that we plow our acres too much and too deep. "Use only a disc," they exclaim. On the other side are experimenters who solidly quote low yields and poor stands of crops grown on land that wasn't plowed before planting but was disc-harrowed, torn up with a subsurface ripper, or was rooted around with a moldboard*less* plow.

Let's turn to Virginia and look into the mulch culture question as discussed by J. H. Lillard, Jr. and T. W. Edminster, an agricultural engineer and a Federal Soil Conservation Service project supervisor, respectively, in the Virginia Agricultural Experiment Station.

Successful mulch tillage, they say, depends on soils, climate and prevailing cropping practices that are used in the area.

In Virginia, we have land ranging from practically level in the Coastal Plain to rolling to steep in the Piedmont, and in the western or mountainous part of the State the land is rolling to very steep, or precipitous. Taking the State as a whole, these widely diversified conditions present a peculiar tillage situation.

In the Piedmont and western Virginia much of the land is not suited to the growing of open cultivated crops because of the erosion that inevitably occurs on the steep and hilly areas. Yet, for a balanced agricultural program, it is often necessary for these sloping lands to be cultivated.

And even the best known soil conservation practices do not offer complete protection against erosion on these steeper areas. Contour strip cropping, for example, has proved a highly successful and necessary conservation practice, according to Lillard and Edminster, but their experiments show that soil movement *does* occur on open cultivated strips, the extent of the damage depending on the land slope and cover crop used.

They set about, then, to develop a further step in tillage practices in Virginia, and to investigate thoroughly the idea of mulch culture, or stubble mulch tillage, as a method of preparing a seedbed on land that is too steep and hilly to use safely the regular moldboard or turn plow. They have continued their tests for four years; plenty of problems have come up, but on the basis of yields of corn gotten and the amount of land tied down where it belongs, the two men are pleased with their results.

First they tested the various tools acclaimed superior by pushers of "plowless farming." They experimented with the moldboardless plow, the regular disc harrow, and plow sweeps and the subsurface ripper that go down to a depth of about seven inches. The researchers found that these tools didn't do a proper job of

stubble mulching in Virginia for several reasons.

For one thing, perennial grasses weren't killed. The stand of the test crop, corn, was reduced considerably. Weeds grew all over the plots during the cropping season. Furthermore, there was evidence that sufficient plant food was not available during the early growing season.

Last year, however, they tried an Oliver TNT plow equipped with two shares that would simultaneously invert the top three inches of the sod layer and plow the subsurface to a depth of seven inches. This plow, the only model available, turned the sod over so that the sun would kill the roots of the inverted sod layer. Two or three weeks later the plots were harrowed with a regular spring tooth harrow. The action of the harrow kicked to the top of the ground about half of the sod material (dead by this time) thereby giving a seedbed surface well distributed with chunks of dead sods; sod that served as a buffer to soften the impact of falling rain.

Similar plots were roto-tilled, or plowed with the conventional turn plow and then disced. All the plots were planted to corn and were fertilized and cultivated alike. Fertilization was as follows: 300 pounds 4–12–4 in the planter; one-third of each plot received no more fertilizer, one-third of each plot received 150 pounds of nitrate of soda before any cultivation was done, and the other one-third of each plot received 150 pounds of nitrate of soda before the last cultivation. Both the latter applications were side-dressings.

The 1947 yields show that the plots plowed with the TNT and then spring tooth-harrowed produced an average of 62 bushels of corn per acre, with a stand of 73 per cent. The plots plowed with the turn plow averaged 66 bushels per acre with a stand of 85 per cent. The plots prepared with the rotary tiller averaged only 42 bushels, with a 51 per cent stand.

It is interesting to note that when the yields were corrected to a 100 per cent stand the inverted mulch treatment (TNT plow) plots gave an average yield of 86 bushels per acre, compared with a yield of 77 bushels per acre for the plots worked with the turn plow and disc.

Lillard and Edminster found some of their earlier troubles overcome on the TNT plowed plots. Regrowth of perennial grasses and weeds were kept to an insignificant minimum. From the fertilizer standpoint, the two men point out that the one year's results aren't too conclusive, but they believe that the early application of nitrogen side-dressings, prior to the first cultivation, will

remedy the observed nitrogen deficiency during the start of the growing season.

Getting a satisfactory stand of corn under the stubble mulch system looms as the biggest obstacle confronting them right now. Lillard believes it is a matter of getting the soil packed sufficiently before planting. He explains the low stands from their 1947 tests as a lack of germination because many of the corn kernels come in contact with the submerged clumps of dead sod instead of the soil. Other problems which have not been conclusively answered will be studied in this year's experiments.

You might ask, "Is the outlook favorable for mulch culture in Virginia?" The two men make this statement, "Mulch culture offers the best possibilities of any tillage method conceived thus far for the development of effective soil and water conservation practices for the steeper cultivated lands of the State." They also believe it will be possible to attain a great deduction in soil and water losses on steep and hilly land and at the same time get acceptable yields of crops grown without increasing the cost of production.

As regards that ever-important question of cost, they point out that no special or expensive farm tools will be required. Lillard says it appears entirely possible for machinery manufacturers to make conversion kits for regular turn plows. He adds that the mulch culture program in Virginia has been discussed with the manufacturers and they are cooperating.

Low Cost Production

Condensed from the Holstein-Friesian World

THE largest single cost in milk production obviously is feed. Some efficient dairy farms can keep feed cost down to only 50 per cent of the total production cost, but on other farms it may approach 75 per cent. Why this big variation? What can the dairyman do about feeding practices to raise his profits by lowering his feed bill?

A review of the nutritive value of roughages gives us the answer. Economy in dairy feeding can be achieved by the production and feeding of palatable nutritious

Reprinted by permission from the Holstein-Friesian World, Lacona, N. Y. June 19, 1948

roughage, with supplementary feeding of each cow with only enough concentrate to make up the balance of nutrients needed for optimum milk production.

To come down to fundamentals the cow must maintain her body and have nutrients in excess to produce milk. The maintenance ration is nonproductive. These maintenance needs to keep the milk factory in good condition must be filled, or milk, the profit item, cannot be produced. The profitmaking milk is forthcoming only when extra feed is given in addition to the cow's maintenance needs. Each cow is limited genetically in her ability to produce milk, and she can reach this inherited capacity only by efficient feeding. If a balanced ration is supplied to meet needs, milk will flow at the inherited capacity.

Since each animal differs in its daily milk and butterfat production as well as in its maintenance needs, it becomes necessary to supply a separate ration for each cow. Anythng short of a palatable, well balanced ration containing low cost protein is uneconomical.

Profitable feeding of dairy cows requires the feeding of both roughages and concentrates. Concentrates are required for optimum milk production. With quality roughage, the cow will maintain her body and have enough nutrients left over to make some milk, and from this point on, dairy feed concentrates take over the job of making milk.

Because nutrients are supplied in their most economical form in roughage, cows should be fed all the roughage they will consume. Then feed each cow only enough concentrate supplement to supply the nutrients needed for the milk she produces. Dairy feed concentrate is the source of protein and is the only way to secure full milk production, but protein is the most costly feed for cows, and its source must be selected with care or expected profits soon melt into feed bills. Obviously the amount of concentrate to feed depends not only on milk production, but also on the kind, quality, and amount of roughage the cow consumes.

The maintenance needs of a cow depend on her size, breed, climate, and activity, etc. Large cows like Holsteins have a higher maintenance requirement than smaller cows such as Jerseys. The maintenance requirements for protein and energy per 100 pounds of body weight are well known and will be found in any modern dairy cattle-feeding standard.

Also the protein and energy requirements for producing a pound of milk of any butterfat content are known. To find the amount of protein and energy required by a 1000-pound cow producing 30 pounds of 4 per cent milk daily thus becomes a simple mathematical problem.

The amount of digestible protein and energy in the dairy feed concentrate can be easily estimated by using feed analysis standards as a guide. The chief complication in practice is estimating the nutritional value of the roughage part of the ration, since the nutritional value depends on the kind of roughage being fed, as well at the stage of maturity and the curing and storage conditions. These factors influence not only the food value of the roughage but also the palatability which governs the amount of roughage the cow will consume.

The milk-making value of dried roughage can be greatly improved simply by cutting at the right time. Top-notch winter roughage will make from 10 to 20 pounds of milk per cow daily if legumes and grasses are cut not later than the full bloom stage. It takes time to harvest a hay crop and, of course, the weather has to be right. That means starting to hay when grasses are heading out and legumes are in early bud.

Alfalfa hay cut during the half bloom stage and cured under favorable conditions is far superior to timothy hay. There is a more usuable food—protein and energy—in the alfalfa than in over-ripe timothy. The cow will give her opinion by eating a lot more of the alfalfa hay; but give her timothy hay cut while heading out and compare it with stemmy, shattered alfalfa, cut in the seed stage, and she will choose the timothy.

No better roughage can be fed than lush pasture. If a cow gets all she can eat, she will not only get her full maintenance needs but enough extra feed to make 20 to 30 pounds of milk daily. Still more important is the economy of pasture feeding. Pound for pound, actively growing pasture is far the most economical milk-producing feed.

In the northern part of the United States, pastures can be maintained five months of the year by: (1) proper fertilization of seeded pastures; (2) use of grasses, legumes, and quickgrowing summer crops such as Sudan grass or soybeans; and (3) by proper pasture management. In the South much longer pasture seasons also are possible.

Dairymen who work on a roughage program that really makes milk, and use only enough concentrate for each cow to supplement roughage properly, will be better able to keep feed costs down.

The feed dealer and the feed manufacturer have more of an obligation to their customers than delivering dairy feed concentrate at the barn door—for continued patronage they are responsible for supplying low cost protein concentrate in palatable form. Should the man use a high-protein con-

centrate to mix with home-grown grains? If so, in what combination and in what proportions? How much dairy feed concentrate should be fed with the kind of roughage the dairyman has in his mow, silo or pasture?

Many feed manufacturers are interested in working out a modern feeding plan for supplying technical service to their dairymen customers, which is taking the guesswork out of dairy feeding. It has taken much of the tedious desk work out of scientific cattle feeding, and in practice is making milk at a minimal feed cost.

A New Slant on Egg Washing

Condensed from Poultry Tribune

Gerald E. Zich

NOTHING in many a moon has so captivated eastern poultrymen as the newly developed techniques for washing dirty eggs. In their thinking on the subject, readers should emphasize "modern techniques" and note that only dirty eggs are to be washed.

On a well-managed poultry farm, by using plenty of clean litter and nesting material, and collecting eggs frequently, only a small percentage of the eggs need cleaning.

Two new developments in egg cleaning by washing have been packing education meetings of poultrymen in several eastern states. One of the new methods, based upon the use of detergents or "soapless soaps," already has two improved variations.

In the first, eggs are washed by hand after brief immersion in hot water containing the detergent.

In the second, the manual labor is saved by immersion of entire baskets of eggs in the detergent solution, then using warm water from a hose nozzle to cleanse the eggs.

A third development is the mechanical washing machine, developed at Cornell University by Prof. Forrest B. Wright, and now being manufactured to sell at about $240. Unlike the previously described detergent methods, the Wright washer uses only plain hot water, about a pint per dozen. A series of whirling disks scrub

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the eggs, which then are dried by electric heat.

Now, although *it's still the best practice to follow a clean egg production program,* the attitude toward the washed egg is changing —"*provided you wash them properly.*" From a comparison of techniques, both in the machine method and the detergent method, it is obvious that "proper washing" is contingent upon the use of hot water.

Several eastern marketing associations have made practical experiments which are quite convincing that dirty eggs can be washed safely if properly done. Experiment stations at Ithaca, N. Y., New Brunswick, N. J., and perhaps others, are holding "properly washed" eggs under refrigeration, along with unwashed controls, to provide comparisons.

Most authorities agree that the old problem of the washed egg can be laid to the use of cold or lukewarm water, whereas the new methods utilize water ranging from 140 to 160 degrees Fahrenheit. There is probably a theory of thermodynamics as well as bacteriology to explain the superiority of hot water washing.

Putrefactive bacteria are supposed to settle in the shell pores. Even brief soaking in water in a relatively low temperature is believed to "drive them into the egg" through these pores, thereafter to grow and prosper at the expense of egg quality.

Quite the opposite, brief immersion in hot water, plain or with detergent, is believed to cause expansion. Bacteria "holed-in" the shell pores are forced outward, to be removed by the scrubbing disks of the washing machine or by the cloth or spray nozzle of the manual operator.

Physical proof of the expansion can be seen in the way shell cracks are revealed. Even the "blind checks," so difficult for the naked eye to detect, stand out after washing.

In the machine, the temperature of water and time of exposure to heat are absolutely controlled by the mechanism. *The other methods require an alert and intelligent operator to maintain optimum temperature and to see that eggs don't soak over-long.*

The best detergent or "wetting agent," "soapless soap," etc., has not yet been determined. Good results are being obtained from most of the brands on sale at grocery stores.

One eastern farmer, whose farm experience with detergent washing of eggs has made him something of an expert, is buying the material in wholesale quantities and retailing to other farmers at about 35 cents per pound in 5-pound bags. Five pounds will wash about 70 cases of eggs, he reports. A tablespoonful is used

per gallon of hot water, the temperature of which is about 115 degrees Fahrenheit (not to be confused with the higher temperature recommended below for the basket washing method).

The technique of hand washing is so obvious it requires little description. One container is needed for the detergent solution, another for the clear rinse water, and cloths or canvas gloves for scrubbing. The lower water temperature permits a short "soaking period," which is not possible with the basket method.

The detergent solution—hot water rinse basket method is somewhat more elaborate as to equipment requirements. A clean galvanized ash barrel is filled with the hot (140–160 degrees) detergent solution to a level sufficient to cover a wire basketful of eggs. Each basket is dipped, then set aside to drain. From 20 to 30 baskets may be dipped without changing the solution. Then, in rotation, all baskets are dipped a second time.

The "hot water rinse" consists of hot water from a hose with a spray valve; the water loosens the dirt which has been attacked previously by the detergent solution, and washes it away. The eggs, still in baskets, are placed in the cool room to dry over night, then be graded and packed into cases.

Washing by the latter method leaves a number of eggs in the center of the basket dirty because the spray does not reach them. However, the saving in time required over manually cleaning the bulk of the eggs warrants the chore of handling these fugitives.

Some users of the hot-water detergent method stress the importance of putting the dirtiest eggs in the outside of the basket and not filling the basket more than two-thirds full.

Many have questioned what happens to hatchability of eggs washed by these methods. No comprehensive tests have been made. One poultryman producing embryonated eggs for vaccine propagation reports he has been washing eggs for some time, with no reduction in numbers of live embryos.

Three-litter Plan Makes Money

Condensed from Successful Farming

Dean C. Wolf

LEONARD ERICKSON'S neighbors may tell you that he uses magic in raising hogs. But he denies it, saying. "I just follow the rules as closely as I can."

Whatever it is, Leonard sent 87,710 pounds of porkers scampering across the butcher's block in 1947, and hopes to repeat this year. He isn't cutting pork production, even tho farmers' intentions are for fewer litters. He figures hogs will be profitable.

One reason why Erickson can turn out so much pork without having a small fortune tied up in housing and equipment is the fact that he raises three litters a year. Early-spring pigs are farrowed during the first two weeks of February. The summer litters come in June, and the fall pigs arrive in August.

This plan enables Erickson to get around lack of space. His central farrowing house has room for only 10 sows at a time, and a place for 4 or 5 more is arranged in the barn. The plan also spreads the labor load more evenly thruout the year. He believes that one man can raise more hogs this way than if all the litters come at about the same time.

In addition to raising all these hogs, he farms alone his 200-acre place in Boone County, Iowa, except for some part-time help in the summer. Nearly all the grain produced on this farm is marketed in the form of pork, and extra grain is bought each year.

Here are a few figures on his pig operations in the spring of 1947. A total of 153 pigs were farrowed from 14 sows, for an average of 10.9 pigs per sow. However, like many hog men, Leonard counts only the pigs he takes to market. He didn't do so badly on that score, either, as he marketed 8.4 pigs per litter. That's more than two pigs above the state average. Altho it was the spring pigs that put him on the list as one of the Master Swine Producers of Iowa, all three pig crops did about the same.

The pigs averaged 211 days in age when they were marketed at an average weight of 227 pounds. The average daily gain was 1.08 pounds.

Leonard points out that he fed them a little longer last year and didn't push them for fast gains. The aim for most hog-raisers in 1947 was to get the most pork

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from a bushel of corn, rather than make a record in fast gains. This was because of the short corn crop.

Much credit for the large litters and extra vigor is given to crossbreeding. Leonard started with Duroc sows and a Hampshire boar. He then backcrossed for a couple of years, alternating with Duroc and Hamp boars. Then he outcrossed to a Poland China boar, and backcrossed with Duroc and Poland boars for several years. Last year he outcrossed again to a Chester White male.

For the future, Leonard is using a so-called hybrid boar. His 1947 fall pigs were out of this combination, and another boar of "hybrid" breeding was on the farm last March. Leonard remarks, "I've got to give it a try. I missed a couple of years' big corn yields because I waited too long to try hybrid corn."

Altho Leonard doesn't earmark all of his litters, picking gilts is not sheer guesswork. Any gilt from a litter of five or under is marked. A marked gilt never gets a chance to raise a litter on the Erickson farm. Tried sows farrow the February litters. Gilts farrow their first litter in June, and are bred back for February pigs. August pigs are out of gilts.

Leonard believes that older sows stand up better with early pigs. He generally doesn't keep a sow for February farrowing if she has a small litter in June, but sometimes he gives her another chance to raise a litter.

His first objective isn't to make a good record. He plans his year's program at the start of a new year as far as number of litters is concerned, and sticks to it.

The pregnant sow gets good care in the Erickson system. It is important in producing strong, healthy litters. The sows are fed a balanced ration of corn, oats, alfalfa hay, and protein supplement. He aims to keep them in good flesh, but not too fat. He points out that a sow has to be in fairly good shape to feed a litter of pigs without going down. The sows have free access to a complete mineral mixture and salt.

Exercise is another important factor. Leonard sometimes scatters extra corn in the field so the pregnant sows get exercise while digging for it. In cold, bad weather, the sows are turned into the barn. Here they run behind the cattle and usually are able to get plenty of exercise rooting in the manure.

He believes in sanitation, and the clean-ground system is followed. Pens are thoroly cleaned before farrowing. Sows get washed before they are penned up. However, sows to farrow in February do not get this treatment. They usually are running in snow and are clean anyway.

All the pigs are farrowed in the central hog house. Then they're moved out on mixed timothy, red clover, and alfalfa pasture as soon as practicable. Leonard likes to get his spring pigs out in early April. Other litters are on pasture by the time they are weaned.

The pasture is plowed up and a new seeding used every two or three years. How long a seeding is used depends a lot on how long the alfalfa stand holds out. With a lot of pigs on the pasture from April to December, there is no danger of keeping the same pasture too long.

Leonard is a busy man at farrowing time. He says it pays to be around then, especially during cold weather. "If you get a pig dried off and get him to sucking, there isn't much chance of losing him from chilling," is the way he puts it. When the sows farrowed early in February last year, Leonard slept on a cot with his clothes on so that he could give the pigs plenty of attention. He was with the sows every two hours and figures that standing the watch paid off in pigs saved.

Brooders aren't used in the Erickson pork-producing system—not even in cold weather. Leonard used brooders for several years, but now believes he gets along just as well without them.

The central farrowing house is a good, tight, concrete-block structure. A lantern is hung in the middle to take off the chill. This system seems to be giving good results. The temperature outside was below zero last year when the February pigs came, but none chilled to death.

This Master Swine Producer also believes in making use of laborsaving equipment. Water is piped to the pigs. Last year, over 40 rods of pipe were used to get water to the pasture area. He uses large self-feeders for shelled corn, whole oats, and a 40-percent protein balancer. However, he hand-fed scarce corn part of the time last year. A simple mineral mixture and salt are self-fed at all times.

Small, movable hog houses are used on the pasture area. Straw shades are provided the hogs during the summer. Leonard believes that shade, along with plenty of water, is an essential in putting fast, efficient weight gains on his porkers.

Appraising the Pedigree

Condensed from The Shorthorn World

Dr. Carl W. Gay

THE pedigree is the record of the ancestry. All individuals have ancestors but not all ancestors are worthy of record. The ancestors, collectively, contribute what is commonly spoken of as breeding, and breeding is the most essential thing possessed by seedstock. There is always some controversy as to the relative importance of breeding and individuality but the preponderance of evidence both in breeder's experience and in scientific fact is in favor of breeding.

It is difficult for some breeders to break away from the old notion that seeing is believing and that as a bull is, so are his calves bound to be. It all depends upon how he got that way. If he has a uniform lot of superior ancestors his individual merit well may be accepted as a fair sample or measure of what his transmitting ability will be, since the average of his ancestry is a dependable forecast of the average of his calves, assuming that he is mated to cows of comparable breeding. If there are few, if any, good individuals in the ancestry, although the bull in question is a standout, then his individual merit means little as a guide to his ability as a sire.

By the same rule, i.e., the average of the ancestry is a forecast of the progeny, the ancestors of low average merit will determine the progeny which will be of the same low level regardless of the character of the individual. Only when individual excellence in sire or dam can be accounted for by corresponding excellence in the group of ancestors from which the animal is derived, can such individual excellence be depended upon as a fair sample of his or her transmitting ability.

The breeder who pins his faith on the excellence of the animal, even though of grand champion calibre, with no regard for the animal's backing in pedigree, is almost certain to encounter keen disappointment when the calves begin to come. That is in accordance with sound genetic principle. All animals are possessed of not exactly dual personalities but of a two-fold constitution. They have their body makeup or phenotype, as the scientist calls it, and their germinal makeup, or genotype.

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The significant fact, missed by the breeder who stakes all on what he can see in the animal's physical makeup is that, while it is the basis of showing awards, it has nothing to do with how the animal breeds. That is entirely a matter of the germinal structure which in turn, is determined by what has been inherited from the ancestors, and only this has any influence on what may be transmitted to or inherited by the next generation. There is no relation of the body to the germ except as a host. Even changes in the character of the body induced by good care and management are not represented in the germinal or genetic constitution of the sire or dam.

If animals could be depended upon to breed as they are, how can one account for a red Angus calf from black parents? The explanation is that the black parents are mixed in their inheritance of color and while themselves black, because that is the dominant color, they carry also the gene for red—the original color of some early Angus. When by chance assortment, both parents contribute a gene or determiner for red instead of black the calf is pure red and can manifest no other color in his hair coat nor can he breed any other color if mated with red. The birth of a red calf in either Angus or Holstein cattle usually comes as a surprise and even with consternation, in some cases, but it could have been predicted by a study of the pedigree of the cattle mated. Such a study would reveal red individuals among the ancestors after which the birth of an occasional red calf could be anticipated but never could such an occurrence be foreseen by means of the most thorough and detailed inspection of the parents.

The only other way the possibility of the birth of a red calf could be detected would be by a breeding test. If a black bull be mated to a group of red cows—the greater the number the more conclusive the test—and no red calf results, the bull may be considered pure for black and will breed true, with no red calves, if mated to black cows. But if about half the calves by the black bull out of red cows are red it proves the bull to be mixed in his inheritance, carrying determiners for both colors and every time he passes on a gene for red the calf is bound to be red because the cow, being pure for red herself, can contribute only red genes.

The conclusion sought by this discussion is that seeing is not believing in breeding livestock, that the bull and the cow breed on, what has been bred into them, and what they have inherited may or may not show up in their own physical being. Breeding is like a checking account, a check is only

good in the amount of previous deposits in the bank account. So a beast can breed on only what previously has been incorporated, by inheritance, in his genetic makeup. This may or may not be indicated in his individuality

Hence, without the pedigree, with the record of the ancestry, the breeding of an animal becomes a very intangible thing. There is nothing about it on which to put the finger. It is impossible to discriminate between the breeding capacity of two bulls or females by an inspection of the animals themselves. Only by a comparative study of their pedigrees can relative breeding merits be determined.

That breeding is considered of greater importance than individuality in the selection of breeding stock, by the majority of observant and experienced cattlemen, is verified amply at almost any auction of purebred cattle. Many outstanding show bulls are great disappointments as sires. Then too, some of the most notorious, fraudulent practices have been to misrepresent the parentage of a good calf, claiming him to be by a noted show bull when, as a matter of fact, his sire was so plain as to jeopardize a sale if he were to be acknowledged as the sire, even though his breeding is gilt edged and he is actually siring uniformly calves superior to those by the show bull to which credit for paternity has been given falsely.

The show bull may have won because, by the natural breeding chance which has determined his physical character, he represents the cream of his race or ancestry, but he never-the-less will breed from the average of his forebears which average is low, consequently the average of his calves will be correspondingly low. His inferior ancestors become a drag on him as a breeder, holding his calves to low levels of merit, while just the reverse is true in the case of the well-bred but plainer bull. The latter's better-than-himself ancestral group constitute a real boost to his capactiy to sire good ones because that is the kind from which he comes, although a trifle plain in individuality—not in germinal structure. All of this goes to show there are good reasons for a third-prize bull, in some instances, out-selling the champion, on the bid of a smart cattle buyer.

Such an apparent inconsistency makes exact sense when viewed in the light of the preceding discussion. It provokes the question, "What does this man get for his greater investment?" The answer is, "A better breeding bull." Then the logical inquiry is, "What are the several attributes of a better breeding bull?" They are measured first by his progeny, if any,

then by his pedigree. "The proof of the pudding is in the eating," and applied to a herd sire his get are the proof. The better of two or more breeding bulls may be decided clearly and definitely if an inspection of their get can be made. Yearling bulls do not yet have any get and the progeny of imported sires may not be available for viewing. The progeny test of a sire is accepted on the premise that the progeny reflects the ancestry and, therefore, the transmitting ability of the sire.

The pedigree is the next best guide to a sire's transmitting ability because it forecasts what his get will be like. Thus, the pedigree is a most important instrument in the selection of breeding stock and to a considerable extent it is relied upon by experienced and successful breeders. The full evaluation of a pedigree, accurately made, involves more than may be apparent to the casual observer. To the uninformed, a pedigree may be as confusing and unintelligible as a railway guide or a sheet of music to the average person—just a conglomerate grouping of names with no particular arrangement or significance. However, the expert reads pedigrees as the musician reads music.

To the trained breeder, the student or pedigree expert, every name and its relation to other names included has a meaning all its own and by-and-large a convincing story of the animal's worth as a breeder is read into it. There is nothing casual about it and the master breeder may be willing to back his judgment by paying $1,000 more for the bull so bred, over other bulls his equal in other respects. The student of pedigree bases his decision as to a pedigree's true value upon three essential things, viz. the character of the individuals record, the combination of lines of inheritance as they may be responsible for nicking, and the intensification of certain lines of inheritance to insure prepotency.

The character of the individuals recorded: As stated above, uniform excellence, by whatever standard measured, throughout the first three or four generations of ancestors, is almost a guarantee that the same standard of excellence will prevail in the progeny, provided the other parent is of comparable inheritance. In beef cattle and meat animals in general, showring awards usually are taken as the measure of merit but in dairy cattle and race horses, where production or performance can be measured accurately, the comparison is simpler and more definite. At all events, and in any pedigree, value is determined by the most of the best—whatever that may involve.

After noting carefully the character of the individual reported in the pedigree, the judge of breeding considers the lines of inheritance brought into combination. Every experienced breeder knows that a mating of two animals may be productive of most favorable results, while the same two animals, each mated to others—just as well bred and breeding as well in other matings—do not produce calves of the same excellence. Certain family lines have been proven—by experience—to complement each other so that their combination is unusually effective, while the other matings are not. The former situation is known as nicking to the stock man and the possibility or improbability of its occurrence is another important thing to detect in the pedigree.

Finally, the evidence of potential prepotency in the prospective sire is of the utmost importance in choosing breeding stock. Prepotency is the power or capacity of one parent over the other to determine the character of the progeny. A sire may be more than one-half the herd by virtue of his prepotency. He is just half because he is one of the two parents possessed by each calf. However, if he is prepotent he stamps his calves more like himself than does any cow with which he is mated and his impress on the herd is more marked.

This important feature of a good sire results from a purity of the germinal material, which the geneticist terms homozygous. It, in turn, is promoted by mating related bulls and cows. The degree of relationship most common in this practice is not greater than fifty percent and constitutes line breeding, but it may include the more incestuous mating of sire to daughter, dam to son, or full brother to full sister. Knowing full well the great importance of prepotency in breeding animals and the extent to which a concentration of desirable lines of inheritance insures prepotency of the desired sort, the evidence of a high degree of such intensification is looked upon with great favor by the student of pedigree.

Get That Fox

Condensed from Everybody's Magazine

Pete Rickard

Fox losses are getting to be a big problem in raising poultry. Low prices for pelts, high employment, which keeps many trappers and hunters out of the fields, and lack of other effective controls have allowed foxes to increase to the point where they have actually put some poultrymen out of business.

Although electric fences, dogs, and flares may keep foxes away from your flock, they are still alive, so remain a threat. The only satisfactory fox control is to kill them, and in most cases this means trapping.

Foxes are easier to catch today than years ago because we have discovered many new ways to outwit them. One of these discoveries is the way of setting the trap. This new method is called the "dirt hole" set. It is being used by almost every successful fox trapper today. There is nothing complicated about the set and with a little practice you can make a finished set in 10 miuutes or less. The dirt hole set is successful because it imitates the work of a fox when he digs out a mouse; thus the diggings you make will look natural to the fox and he will not be afraid.

The hole is approximately 4 inches in diameter and 8 inches deep. The trap is placed in front of the hole and when the fox tries to get the bait out of the hole he steps in the trap. You may wonder if you can make the set look natural. The truth is that foxes do not dig any two holes alike. This makes it easier for you, because you can vary the size of the hole and the dirt pattern in front of it.

The dirt hole set can be made almost anywhere but it is best to put your traps where you can see several of them from one point. This will save you time in looking at them. Place your sets from 100 to 200 yards apart in open fields around your farmstead or range. Locate your sets in open fields and in short grass. Foxes are more easily caught at these locations. It is advisable to set at least six traps, since you will catch a woodchuck or skunk occasionally.

Another reason for setting several traps is so that foxes will be

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sure to find some of your sets. They can smell bait and lure up to 100 yards. By placing your sets about that distance apart you will be making a line of protection around your farm.

First you need the proper traps. If you use traps that are not suited for fox trapping, you will find several traps sprung with nothing in them. The best traps to use are the Victor No. 2 Coil Spring, or the Blake and Lamb No. 2 Underspring. Before making any sets the traps should be boiled in a lye solution to take off all the oil. Then blacken them with a log-wood crystal solution. This gives them a natural bark odor and also prevents them from rusting for some time.

Adjust each trap so the pans are level and tighten the pans so small birds and small animals will not spring them if they should walk on your sets.

You need a trowel or some kind of digger tool to dig the bait hole. The tool should be strong enough so it won't bend when digging in hard ground. You will also need a sifter to sift dirt over the trap. It prevents stones and clumps of dirt, which would clog the trap jaws, from getting on the trap covering. Sifted dirt also makes the set look natural. You can make a sifter by using ¼-inch hardware mesh tacked on a wooden frame.

A hatchet or hammer is needed to drive in the trap stakes. A hatchet is better than a hammer because you can use the blade to cut the sod away for the trap bed. The fork is used to level the dirt evenly over the trap.

Trap pan cloths are used to keep dirt from getting under the pan. Milk strainers are best. Be sure to use new ones. Cut them so they fit just inside the jaws of the trap.

A dirt cloth is used to lay all surplus dirt on. When the set is finished all dirt not used to cover the trap is carried away from the set. This dirt cloth is not absolutely necessary, but it helps in making a neat set.

Trap stakes are also needed. Anything that will hold a fox will do. Old wagon wheel spokes make good stakes. If you do not have these, make them out of inch or inch and a quarter boards. Saw them on a taper, with the tops about 1½ inches wide and the bottoms coming to a flat point. Maple, beech or any hard wood makes good stakes. A 12 inch stake is used in hard soil, 14 or 16 inch stakes in sandy soil. Bore a small hole 2 inches from the top of the stake for the wire to go through which fastens the trap chain to the stake.

The bait hole is approximately 4 inches in diameter and 8 or 9 inches deep. The trap bed is dug down about 2 inches below the surrounding dirt. The stake is driven down out of sight and then

a little loose dirt is placed in the trap bed so the trap can be pressed in the dirt. This helps it to be solid. You don't want your trap to rock or tip when a fox steps on it.

After the trap is placed in the bed the trap pan cloth is put over the pan and inside the jaws to keep dirt from getting under the pan. When the dirt is sifted over the trap you are ready to put the bait in the bait hole. When this is done, pick up your tools and leave the set.

Do not hold your jaw over the trap when putting bait in the hole. If any bait gets on your trap covering, the fox will dig up the trap looking for more bait which he will think is buried in the dirt. You don't want this to happen because a fox digs carefully and will find your trap but will not get caught. Also keep bait smell off of your hands and gloves. This is another way that you can get the bait smell on your trap and on the dirt over your trap. One more thing—wear rubbers or rubber boots when making the sets. Foxes can't smell you so easily.

You must use something in the way of a bait that will draw a fox to your set and then hold him there until he is caught. Selecting a bait is difficult for poultrymen, because the fox may be filled up on your poultry by the time he gets to the trap. You must have something that will appeal to him as a dessert does to you. If he takes only one sniff, he is not likely to get caught. If you use a good bait, he will stay at the set and try to dig it out, so will be waiting for you in the morning.

Trappers have worked all their lives on different bait and scent formulas, so there are many kinds. A poultryman or farmer does not have the time, experience, or facilities to make complicated baits. If you don't want to buy a prepared bait, try chicken or beef. They are considered to be pretty fair baits, though in hot weather you must change them every day because they mold quickly. Foxes will come to tainted baits but they do not like moldy ones.

Foxes are not as hungry as most people think. Food is plentiful during most months and foxes are good hunters. Most professional trappers and conservation men now use prepared baits. When made correctly, these baits do not spoil or mold. They have an odor and taste that is always a treat to a fox.

If you follow these instructions carefully you should be able to rid your farm of foxes. When a neighborhood campaign is put on, results are even better. Poultrymen who live in a state where a bounty is paid should be sure to turn in the foxes they catch. The money will pay you for your time and equipment.

Your Sheep May Need Cobalt

Condensed from the Farm Journal

Arthur L. Pope
University of Wisconsin

If your sheep lack appetite for hay or grass (even though it looks all right to you), it may be that they need a little cobalt. Just 20 cents' worth a year can make all the difference in the world in a flock of, say, 30 ewes.

Cobalt is one of the so-called trace elements or minerals. Sheep don't need much of it, but they must have some. The same is true of other four-stomached animals, such as cattle.

Some sheep raisers have found that just one ounce of cobalt sulfate mixed with 100 pounds of salt can do great things. It not only steps up appetite, but may actually keep sheep from starving to death on apparently good feed.

Only recently have we known that sheep and cattle need cobalt. In the last four years cobalt-deficient areas have been found in several east-coast states, in Michigan, Illinois, and Wisconsin. New sections are being discovered each year.

If cobalt is short in the soil (and consequently in feed), it shows up quickly in sheep. They start losing interest in the feed rack. The feed may look all right, but the sheep won't eat.

Soon they "gaunt up" and start losing weight. In their weakened condition they're an easy mark for diseases and parasites.

Adding a very small amount of cobalt has brought some near-miraculous "cures." Almost as soon as the sheep lick the "cobalt-ized" salt, they change their minds about the feed. Within three or four days they probably will be on the road to recovery.

Here is an example of how cobalt can work. For several years northern Wisconsin sheep men had been having trouble. They couldn't get their sheep to eat. Many of the ewes were so thin and weak they died while carrying their lambs. Others dropped dead lambs, or, if the lambs were born alive, the ewes had no milk for them.

Three years ago this summer, the University of Wisconsin brought some of these sheep to the Experiment Station at Madison. They also brought some hay that

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Philadelphia, Penna., July, 1948

had been grown in the northern part of the state.

The sheep were sorted into two lots, equal as to condition and weight. They both received the northern-grown hay and corn gluten meal (a feed which contains practically no cobalt). However, one group got one ounce of cobalt sulfate in each 100 pounds of salt; the other had only plain salt.

For three months there was no noticeable difference in the two lots. Then the lambs getting salt alone went off feed. By the end of another six weeks, they were near death. The lambs in this group had weighed the same as the others 4½ months before. Now they averaged only 65 pounds, compared to 115 pounds for the second lot. Cobalt sulfate was then added in their salt, and within four days they were eating as much as the other group. The first month after adding cobalt they gained 26 pounds apiece.

Should you feed cobalt to *your* sheep? If you farm in an area where cobalt is known to be low, by all means do so. A pound of cobalt sulfate will cost you from $1.10 to $1.50 at your drug store or biological supply house. That's enough to mix with 1600 pounds of salt. That much salt will last a flock of 30 ewes almost eight years. One pound of lamb per year will pay for it!

Another good source of cobalt is cobalt carbonate. It is dryer and more expensive, but contains twice as much cobalt. You need only one-half ounce of this chemical to mix with each 100 pounds of salt.

A good way is to add the cobalt first to a double handful of salt, then with several handfuls, that amount with a pail of salt, and finally with the remainder of the 100 pounds. A thorough mix is naturally best.

Another point you may wonder about: it's safe to feed cobalt and phenothiazine together in salt for sheep.

Meat on the Lifeline

Condensed from the Nebraska Farmer

Anna Dee Weaver

THE farmer today, except on very rare occasions, enjoys a market for all the livestock he can produce. This market didn't just happen. It has developed gradually as confidence has been established in the many segments of the route from producer to consumer. These segments are the trucker, the railroad, the commission firm, the packer, the wholesaler, the meat market and the housewife. Failure at any point throws the entire set-up out of joint, so dependent is one upon the other.

Farmers are familiar with the routine of slaughtering. In packing plants this job is dispatched with the utmost sanitation, speed and labor-saving efficiency. They are familiar with the cuts of dressed meat bearing the inspection stamp of the U. S. Government. They enjoy the "made" products, wieners, sausages of many types and flavors, and a variety of canned meats, including the new ones for infants and toddlers, dried beef and cured meats.

Farmers are aware of the fact that the home economics departments of the packing plants develop new recipes using meat and lard and that they advise homemakers about the advantages of serving meat daily. Meat is given wide publicity through advertising channels—newspapers, magazines, radio, cooking schools and demonstrations at women's meetings. Two organizations—the National Live Stock and Meat Board and the American Meat Institute—maintain staffs of home economics experts who develop recipes and spread the gospel of the value of meat in the diet; they also foster research in the meat industry. These activities increase the demand for the livestock the farmer raises, and in a broader sense this educational work is designed to raise the health standards of the American people.

While meat is the primary product of the industry the by-products are also of great economic importance. On the average, cattle will yield only 530 pounds of beef from 1,000 pounds of live weight; hogs will yield 70 percent of live weight and in lambs the dressed carcass is only about 47 percent of the live

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weight. Through research the so-called waste products have been converted into an amazing number of usuable products. And to think that a century ago the packers actually paid to have this volume of material hauled away!

Around 75 different items produced in whole or in part from livestock products are used every day in the average American home; the total number of by-products is much greater. Nothing is too small to be saved . . . it requires about 10,000 cattle to produce one pound of pituitary gland extract in powdered form. Well-equipped research laboratories are required for the development of new by-products and for their improvement and standardization.

Of the edible by-products meat specialties rank first in importance. These are livers, hearts, kidneys, brains, tripe and others. Some were once considered worthless; most of us can recall when the butcher gave liver away as cat-food. Today we know it as a top-ranking health food. In 1926 Dr. George Minot of Harvard discovered that if raw liver was fed to patients suffering from pernicious anemia the disease would not prove fatal. Research shows that liver and other glandular organs are a rich source of certain vitamins and minerals.

Fats are another important edible by-product. The industry is engaged in a vigorous program to further the use of lard and other animal fats.

The development of canned dog food has added greatly to the demand for the farmer's livestock. In 1925 only a few thousand cases were produced; a half billion pounds were produced in 1939, in addition to a quarter billion pounds of dry dog food.

Natural casings (selected animal intestines) are used for both edible and inedible purposes. Their chief use is for containers of sausages. Chitterlings, prepared from the smaller intestine of hogs, is a delicacy popular in some areas. Tripe, a portion of the walls of the cow's stomach, is also in demand in some sections. Non-food uses of animal intestines include surgical sutures, strings for musical instruments and sporting equipment. Eleven lambs are needed to produce enough string for one tennis racket.

Every homemaker is familiar with gelatin. This product is the white structural tissue of the animal and may be obtained from pork skins, bones or calf skin. Edible gelatin is used in the making of gelatin desserts, marshmallow, ice cream and in canned meat products. Other uses include photographic film and druggists' capsules. One of the newer uses for gelatin, developed during the war in the medical field, is for treatment of shock.

The value of by-products of the meat packing industry to the medical world in saving lives and giving relief from ailments cannot be estimated. The value of liver has been mentioned. Insulin, from the pancreatic glands of hogs, cattle and calves, is used in the treatment of certain forms of diabetes. It takes 20,000 cattle to produce one pound of crystalline insulin. The hog pancreas yields enzymes used in relieving digestive disorders. Thyroid extract is used to treat goiter and cretinism. Hayfever and asthma sufferers have been relieved by the use of epinephrine extracted from the suprarenal glands of animals. Treatment of many diseases depends upon a supply of the glandular extracts.

Even digestive juices are used. Essence of pepsin is used for removing tissue from unhealthy wounds. Rennin, obtained from milk-fed calves, is used in cheese making. Trypsin is used in the tanning of leather. Bile from cattle is manufactured into products used in the treatment of certain liver, gall bladder and intestinal disturbances.

Dried blood finds, its way into animal feeds, fertilizers, waterproof glues and plastics. Through wartime research a method was developed for separating the red blood corpuscles from the plasma. This plasma is being used experimentally in operations to stop excessive bleeding. Albumin from cattle blood is used in a test to detect the presence of tuberculosis.

This list of life-saving materials, which is far from complete, shows us that untold suffering is relieved through the use of meat by-products.

Cattle hides and sheep pelts are the most important of the inedible by-products. About 85 percent of the leather goes for shoes and the other 15 percent is used in baggage, harness, upholstery and sports equipment. Calf, pig and sheep skins are also used to make leather goods. The pulled wool from sheep pelts contributes about 20 percent of our production of woolen goods. Lanolin, a component of wool grease, is used for making cosmetics and ointments. And milady's mouton fur coat is made from lamb pelts!

Cattle and hog hair are becoming more and more important. Curled cattle hair from tail switches goes into mattresses and upholstery. Cattle body hair goes into the products of felt for rug-pads and insulation. The fine hair from the ears of cattle is used to make artists' camel hair brushes. Air filters in air-conditioning units and carburetors of automobiles are made of hog hair.

Animal bones are used in feed, gelatin, glue, cosmetics, knife handles, buttons, pipe stems, piano keys and other products. Horns

make hair ornaments, combs, spoons, ash trays and umbrella handles. Cattle feet produce neat's-foot oil. Hoofs are used in the manufacture of cyanide of potassium, which is important in the gold extracting industry; they may be used in fertilizer, in plaster, and in combs, buttons and ornaments.

Soap is the chief inedible use for fats. Glycerine, a by-product in soap making, has over a thousand industrial uses.

Thus research in the livestock processing industry continues.

The Feeding of Milk Goats

Condensed from the Rural New Yorker

V. P. Conklin

With grain selling at $5.00 a hundred and good hay at $50 a ton, people who never gave a goat a second glance, begin to look at her speculatively. Add, too, the fact that about six goats can be kept on what it takes to feed one cow and that a really good goat gives as much milk in a year's time as the average cow and probably you won't be believed. Actually, we have just started on the possibilities for milk production which the dairy goat affords. Where she shines is in an environment that would not support a cow; there are so many things she can turn into milk, with an amazingly low bacteria count.

Temperamentally, goats are happiest when they are not confined. Lounging-room management suits them better than any arrangement of stalls and stanchions we have tried. They are affectionate and responsive when they enjoy complete freedom, and they grow stubborn and restless when they are tied up. They are afflicted with parasites, as are sheep, but with almost no diseases. However they do require abundant exercise, clean grazing and fresh air if they are to turn out strong kids and continue milking through a long lifetime. For these reasons, either range or pasture is most desirable. Time spent in improving pastures is saved hundreds of times over as nanny harvests her own food in the roughage which makes a big, strong frame.

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Whether the acreage available is large or small, we have found that a good arrangement is to divide it into four sections. Plant the first to oats, Ladino clover and orchard grass. When the oats are five or six inches high, turn the milking does in and let them crop the oats and any stray weeds the first season. In the second year, the Ladino and orchard grass take over and, with favorable weather, may be good for two or three seasons. The grass helps cut down the chances of bloat from straight clover. If the goats do not keep it cropped clean, cut it for hay or silage when necessary to stimulate new growth. The second section may be alfalfa for cutting and occasional grazing when the first section needs a rest. Section three can be sown to "succotash," a mixture of soybeans, millet, sorghum and corn for ensiling. Section four can be rape or a truck patch with rows of stock beets and carrots, Jerusalem artichokes, sunflowers, cabbage and kale. Winter wheat and rye grass are good cover crops to follow the succotash and truck in the last two sections. Rye grass is grand forage for late Fall and early Spring.

These sections should be rotated from year to year. The goats manure them richly but they should be well limed; superphosphate which has been mixed with the stable droppings, and potash are added as required. We have long known of the connection between a soil deficient in iodine and the incidence of goiter. The last American Veterinary Association convention established a similar link between acid soils and paratuberculosis. Cobalt and manganese are also essential to the best of health. It is easier and cheaper by far to doctor soils than it is to doctor plant life, and it is better to doctor plants than livestock and livestock than humans. Success in the dairy starts in the soil.

Goat pasture should include some browse, such as shrubs and trees, as well as grasses. These do not produce a great quantity of milk but the chances are that they contribute to its quality due to the fact that, while the soil on which they grow may not be as rich as that of improved pasture and cultivated ground, there is a chance that some of the rarer trace elements have not been drawn out of it with a long succession of harvests. Scrub oak, wild apple and other fruit trees are greatly relished by goats, and so are birches, maples, poison ivy and blackberries. Wild garlic does things to the flavor of milk that you wish it wouldn't. Laurel, both mountain and sheep, are poisonous. Wild cherry, when it is wilted and frostbitten, and also deadly nightshade (belladonna), are killers. Meadowland grown up with goldenrod and asters, boneset and

Joe-Pye-weed, is a heaven to goats. Take your milkers for a walk of an afternoon and watch them go for it. An ailing goat, turned out to graze, will pick her own medicine and tonic where a variety of such herbs is offered. Along the seacoast, goats enjoy the seaweed left by the tide on the beach. A wise precaution, before pasturing where growth is lush and wet, is first to fill the mangers with straw or corn stover. These are mostly cellulose and help to absorb the gases that cause bloat. Incidentally, cellulose wallboard is not indicated for goat houses, unless you like to see your pets eat themselves out of house and home.

Another aid in the production of goat milk is to bring the herd in from pasture two hours before milking. This time space allows strong flavors to work their way out of the system. Hay may be fed during that interval. We feed silage directly after milking and make sure there is none left in the mangers two hours before milking starts again.

Variety in the silage is no mistake. We prefer two or three smaller silos to one large one. For the family goat, barrels will serve. When the weather is not favorable for haymaking in June, the first silo is filled. Second and third cuttings, later in the year, make better quality hay as a rule, as the end of Summer is often drier than the beginning. The "succotash" fills the second silo about the time the bean pods are filled out, before they dry and scatter. Cabbage leaves, left by the truck farmer next door, mixed with corn stalks make delicious sauerkraut in the third. Just make sure the cabbage hasn't been dusted with arsenate. Even wild hay, from a friend's meadow, has gone into this pickle and is relished in all seasons.

When the public utility people go through your roadsides and clear their wires, gather the slash they leave behind them and cure it, leaves and all, as you would hay. Add hedge clippings and all boughs pruned from your fruit trees and ornamentals. Nanny will amuse herself for hours stripping the bark from them, and the leaves are her idea of candy. More than one goatkeeper has an agreement with the grocer to swap milk or butter or cheese or kids for carrot tops and cauliflower trimmings that collect in the store. Citrus fruit peels are valuable for their vitamin C. They may be bought dried, like beet pulp, a by-product of the canning and refining industries. Pea pods and vines and almond hulls are worth picking up if you can come by them easily. Roots, such as carrots, mangels, artichokes and potatoes, should be sliced so the goats will not choke on them.

When the question of grain feeds arises, our favorite is a mixture of whole wheat, corn, soybeans, oats and bran, about 15 per cent protein. You cannot buy wheat or soybeans today or the sunflower seeds that we used to add through the lean months of February and March. Soybean and linseed meal are substituted when we cannot raise our own. For a change, now and then, we grind this very coarsely and mix it with enough warm water to make it crumbly, just before feeding. A dash of molasses is a special treat adding iron to the ration. Do not grind much at a time or hold ground feed long; it loses some of its best elements through aeration, and the goats sniff at it and pass it up. Any grain left uneaten at the end of a half-hour should be swept up and fed to chickens or other stock. Salt should be available at all times. Fresh water is supplied two or three times a day. Hay is not wasted as wantonly when it is cut in four-inch pieces, instead of full-length. However, if it is chopped after it is brittle, the valuable leaves which shatter, should be saved for other livestock and poultry. The does themselves will refuse them as they do every substance that is on the powdery or dusty side.

One final admonition on catering to the capricious milk goat is to be clean. A goat will pine and waste away before she will nip a soiled morsel. She will pull precious, third-cutting alfalfa out of her manger, toss and trample it and lie down and roll in it, and turn up her nose at it ever after. Chop and feed it sparingly and not too often and she will appreciate it. Devise a rack or manger which requires that she work for what she gets. Remember that moldy, spoiled silage makes good mulch; don't pollute the manger with it. Rotten fruits and vegetables have their place on the compost pile. Goats are in demand all over the world today because they can take an amazing variety of substances and turn them into milk. If you are resourceful, you can find the wherewithal to keep a goat well almost anywhere.

Corn Borer Parasites Established

Condensed from The Indiana Farmers Guide

During the past five years the Purdue University Agricultural Experiment Station, in cooperation with the U. S. D. A., Bureau of Entomology and Plant Quarantine, has introduced five foreign species of corn borer parasites in Indiana to supplement corn borer control, according to M. Curtis Wilson of the Purdue Department of Entomology.

It has long been known that the natural enemies of our major pests play a significant role in control. In an attempt to increase natural control, workers of the Bureau of Entomology and Plant Quarantine studied the biological control of the corn borer in its natural habitat in Europe. After determining those natural enemies which were specific to the corn borer the more promising species were brought to America and were colonized at the federal parasite laboratory. From there they were distributed to Indiana and other corn borer infested states.

When introduced into a new environment, parasites encounter obstacles such as differences in climate, abundance of host, etc., to which they must adapt themselves if they are to survive. To determine the degrees of success met by these parasites in establishing themselves in Indiana an extensive survey was made during the fall of 1947. Corn borer larvae were collected in the various counties where parasites had been liberated and placed in rearing cages to determine the parasites which emerged. The results showed that one of these parasites had succeeded in establishing itself under Indiana conditions. This species is a parasitic fly known technically as lydella grisescens.

In Tipton county where it was first introduced, it destroyed 30 percent of the corn borers last season. It was found that it had also established itself in a number of the other counties and promises to become a factor in the control of the corn borer.

The "lydella" parasite has an interesting life history. The adult fly, approximating the size and appearance of the ordinary housefly, deposits its young on the leaves of borer infested plants. These parasitic maggots seek out the borers and enter their bodies where they feed and eventually kill their host.

Reprinted by permission from the Indiana Farmers Guide.
Huntingdon, Indiana, July 1, 1948

Whereas natural enemies may play a large role in reducing the corn borer population, according to Mr. Wilson, they must not be expected to control completely the pest. Therefore the corn grower should adhere to other practices recommended by the Purdue Department of Entomology, including delayed planting, that is, between May 20 and June 5; the use of adapted hybrids; and complete plowing under of corn residues.

What About Windbreaks?

Condensed from the Pennsylvania Farmer

Morris A. Hall

THE farm windbreak is an asset whether in windy sections or elsewhere. Windbreaks prevent soil from drying out too quickly and from blowing away. They protect grain fields and orchards from mechanical injury. The combined effects of wind reduction are stimulating to crops. A belt of trees reduces the penetrating capacity of winter winds, making the farm house more comfortable and cheaper to heat. Through shade and verdure in summer the adjacent area, in fact the whole farm, becomes a more pleasant place. If a heavy belt of woods is planted, within a few years it becomes a source of wood and timber for use on the farm and for sale.

One great benefit of a well-planned, properly-planted windbreak is savings in crops. Saving them from blowdowns that make harvesting difficult or impossible. A Michigan cherry raiser estimates that through prevention of wind bruising, his windbreak saves him $500 worth of fruit every season. An apple grower had a similar experience except that he gained high quality fruit in the lee of an evergreen windbreak. In Minnesota a 28-foot windbreak alongside a cornfield afforded protection for a tenrod strip against winds up to 50 miles an hour velocity. Beyond the break and protected strip wind blew down half the corn, damage being greatest farthest from the trees. The windbreak occupied two acres and protected 18 acres.

A New York farmer found the annual winter temperature behind

Reprinted by permission from the Pennsylvania Farmer, Pittsburgh, Penna., June 26, 1948

his windbreak so much lowered as to give him the equivalent of moving his farmstead 300 miles south. This increase of temperature is beneficial to anything growing on this land, or in preparing it for crops to be put on the land later.

Another favorable angle is the effect of a proper windbreak on the farm's value. An Iowa farmer got $5,000 more; the trees had cost him less than $100 about 10 years before. Another farmer lost a sale through lack of a tree belt. Going to the farm after preliminary agreement, the buyer saw the windbreak on the adjoining farm, none on the one he planned to buy, and promptly threw up the deal. In Indiana, a farm dealer advises "A windbreak will add $10 an acre to the sale value of any farm." He cited many experiences to prove this point.

In corn country the tree hedge is credited with raising more corn through increasing mid-day temperatures. Corn likes hot weather, the hotter the better. Alfalfa is benefited in winter by the snow cover which the break induces, reducing or avoiding winter-killing. Wheat, barley, rye, and other grains are helped in much the same ways. Where there are strong winds the striking benefits from wind barriers on two, three or all sides of a couple acres of house garden are almost unbelievable. Reduction of evaporation plays a large part in this.

The tree protection should be as wide and as tall as the adjacent land being planted justifies, all things considered. Its influence extends 10 times its height, so a planting that grows 60 feet gives twice as much protection as one that grows 30 feet. Trees set close together to produce great height have few or no branches down low and afford no protection there; additional rows of lower trees are necessary. Evergreens which hold their branches clear to the ground in maturity give greater protection low down, eliminate need for additional planting, reduce land area involved in the protective planting.

Favorites in the East among the evergreens are Norway spruce, white pine and Scotch pine. A good plan is to avoid too much dependence on a single row by planting two rows, set rather close and staggered in the rows. This gives maximum results with minimum number of trees and land. Such a planting gives no wood crop. If the farmer plans an actual cash return from his windbreak in later years, he must consider the wide multiple-tree type. In such a hedge the center row or rows consist of the tallest trees set very close together to induce quick, tall growth, with slower-growing trees of lesser height on either side, possibly a third layer

of still slower lower-growth outside these.

When center trees are set 4 or 5 feet apart there will be a considerable quantity of trimmings after three years. These can be used for fuel. As the trees get older and taller, the hedge gets thicker, more solid, and it is possible to take out some timber to sell. In the case of one 21-year old windbreak, 4.74 cords of wood an acre each year was the yield.

Considering fast-growing wood, cottonwood will grow 3.5 cords a year. Set close this tree will grow to 70 feet or more and give wide protection from its height although it may be so thin and scanty close to the ground as to need other trees planted alongside. Ash will not grow so tall, can be counted on for 40 feet or more and will grow 1.5 cords a year. Norway spruce can be planted as close as 5 x 5, or better 6 x 6 feet, and later thinned to 12 x 12, yielding a timber crop over the years. At this 12 x 12 spacing lower branches will remain alive and form a thick heavy windbreak clear to the ground. This species is suitable for underplanting or side planting for cotton wood or black walnut when they have proved too thin low down. Green ash grows well with cottonwood, will grow on poorer land than white ash or many other woods, is suitable on poor worn-out clay soils. In wide plantings with trees close together in rows, where cattle have been kept out, the heavy leaf mulch improves the soil greatly.

Oak will grow on fairly poor soils and yields a wood always in demand at high prices. It combines well with white elm which gives great height but scanty lower part. Black locust does well on poor sandy, gravelly or clay soils, and it sprouts vigorously. It is subject to the locust borer, so the superior most-resistant Shipmast variety should be chosen. This grows taller, straighter, making superior timber but not any better windbreak material. Catalpa is a quick-growing wood, requires a fresh, well-drained soil with plenty of water as a sandy river-bottom or stream edge. It can be set close, 6 x 6 for large tall trees, needs some cultivation, much pruning and thinning.

Of the tallest trees, cottonwood, Chinese elm and sycamore are recommended; in the not-quite-so-tall group are black locust, American elm, green ash, hackberry, chestnut (if available), black walnut, yellow poplar, white and golden willows (along streams), honey locust, bur and post oaks, Russian mulberry, hardy catalpa and osage orange. In the evergreens Ponderosa pine, red cedar, Black Hills spruce, Austrian pine, Scotch and white pine, and blue spruce. For the

sides of broad windbreaks (protection only — no by-products) Russian olive, Siberian pea tree, wild plum, chokecherry, common lilac, Persian lilac, tamarisk and soapberry (on sandy soil).

The Chinese elm is difficult to obtain, some varieties are of doubtful hardiness, and its long-term value under U. S. conditions has not been determined, so it should be considered after the others. Exceptionally fast-growing blue gum or eucalyptus, not listed above, yields fuel at 4 to 6 years, saw timber in 20 to 30 years. Under favorable conditions in 8 or 9 years it will yield 30 to 40 cords of fuel an acre each year.

In considering all these trees the farmer must weigh the compromises due to height, speed of growth, density of foliage, tolerance (ability to withstand close planting), amount, quality and value of trimmings (as fuel), amount, quality and value of timber (in later years), natural reproduction (to offset cutting out trees), soil demands, many other detailed tree factors. Some of these must be balanced against the width of strip used, land position and value, number of rows to be planted, possible uses for closely-adjacent land, influence on crops to be raised in protected areas, and other abstract farm factors. If a wide windbreak is chosen more protection is afforded but more land must be used for it. A very high windbreak must be wide to be effective near the ground, necessitating more trees, a wider strip of land.

It would be wise to have the Forest Department's or the county agent's suggestions on choice of trees before seeking those of the nursery or tree seller. The stock bought should have been grown within the region in which it is to be used and under similar climatic conditions, especially rainfall.

What's In a Name?

Popeye's favorite food originated in ancient Persia and was later grown in North Africa. The Moors took it to Spain, and Englishmen finding it there, called it the "Spanish plant." The shift from "Spanish" to "spinach" was easy. —*N. J. Farm & Garden*

Mulching Vegetable Crops

Condensed from the New England Homestead

Avery Nelson

GARDENERS who pass up the vegetable mulch system next year are missing a chance to grow superior crops with little effort. The advantages of mulch are so numerous and the delight of gardeners who have used it so obvious that one wonders why the practice is not more widespread.

The advantages of mulching fruit trees and small fruits have long been accepted. Why do we hesitate to place hay, straw or any other plant material between the rows of our vegetable crops? The answer may be in the casual reference to mulch by garden writers who never attempt to explain what goes on under the mulch or why it is superior to any other method of growing vegetables.

Mulching is not lazy gardening. It is merely good sense. Three tons of alfalfa hay to the acre placed on the surface of the soil are equal to ten tons of manure. This would be a couple of bales to 1500 square feet. As this material breaks down it provides food slowly in the amounts required by growing plants. In my experience no other fertilizer has been needed.

It is a simple thing to place hay, straw, leaves, weeds or any other plant refuse between the rows after the vegetable plants are up, and in fact it may be put on at any time during the growing season.

The obvious advantages are that the soil does not bake and cake over, moisture is retained and weeds are held down. But the two major benefits are: 1. Plants are being fertilized in the amount they need when they need it. 2. The feeding roots have a chance to spread through the upper few inches of soil without being chopped off by the hoe or cultivator.

The most striking results are obtained with the mulch on tomatoes and potatoes, both heavy feeders though every other vegetable crop is benefited. I have grown potatoes at the rate of 500 bushels to the acre without blemish on the tubers or trace of disease on the vines. I have never had blight on tomatoes grown under a hay mulch and the fruits are usually show specimens.

Reprinted by permission from the New England Homestead.
Springfield, Mass. July 10, 1948

The relationship between disease, insect pests and mulched plants is one I am not able to explain. But it would seem that the plants are so well nourished and growing conditions so ideal that disease and pest attacks are reduced to a minimum. Obviously a healthy plant does not contract disease any more than a healthy child.

Potatoes like a straw mulch for straw is rich in potash. Oldtimers will recall that "straw" potatoes commanded a premium price in the markets. Squashes and cucumbers respond astonishingly to a straw mulch and if you want a hard strawberry use this material. Old hay works best with tomatoes, beans, corn and most other vegetables.

The mulch should be maintained at a depth of from four to six inches so that decay is always proceeding at the soil surface. Any lighter application will dry out and defeat the purpose. There must be sufficient depth so that the bottom layer is always moist since moisture and warmth are necessary for soil bacteria to convert the hay or straw into plant food.

One of the advantages of mulching commonly overlooked is an even soil temperature. The soil under a mulch has been shown to be at least ten degrees cooler than bare soil on a hot summer day. Likewise the mulch prevents freezing and thawing and of course a garden that has gone through the winter under a mulch is ready to work much earlier in the spring. In fact after a year or two it is perfectly possible to push the mulch aside in the spring and plant with no further operation.

Gardeners frequently object to mulching for two reasons. First, a supposed fire hazard. Second, they have been led to believe that a decaying mulch will take nitrogen from the plants.

If the mulch were allowed to become tinder dry there might be a fire menace. But this seldom occurs. The small gardener can wet down the mulch whenever he chooses but I have never considered it necessary.

Experiments have shown that there is no nitrogen deficiency when plants are mulched with alfalfa hay or for that matter any old hay. Straw is slower to begin decaying and there may be a momentary lack of nitrogen, but it has never shown an appreciable effect on my crops.

How Poor Can a Farm Get?

Condensed from New Jersey Farm and Garden

H. Russell Stanton

SOLID green, acres and acres of it, stretched away wherever we looked. That was the picture that Charley Chauncy and I found a little while back when we stopped to call on John G. McCleary at his farm near Sewall, New Jersey.

I had heard that the McClearys were among families which won special merit awards for outstanding achievements from the Farmer's Home Administration. After talking with McCleary and seeing the way he has built up his farm, I could see why the state advisory committee of the FHA had singled out this family for honors at Farmers' Week.

Chauncy, Gloucester County FHA supervisor, piloted me over to Sewell. It turned out that the McClearys came to the farm just about 15 years ago, starting under more than their share of handicaps.

Leaf back your almanac and you'll see that 15 years ago was a fashionable year for jumping out of windows and otherwise taking a quick way out of financial troubles. Anyway, the McClearys moved into their present farm in 1933, and about the first question they asked was, "How poor can a farm get?"

A series of tenant farmers had come and gone, each taking a little less than the one who went before, until bottom was being scraped. Or as McCleary summed it up, "They had hogged it. Why," he said, "they had even sold the corn stalks—and they're the best soil builders we have, in my opinion." The McClearys intended to stay only a year, but it seems all the farm needed was an experienced hand to put it back into production. As John saw it was possible to improve the soil, he decided to stick around, and five years ago he began buying it. Now it's more than half paid for.

McCleary's operation is based on turkeys and vegetable crops for market. He plans to have about 300 Broad-Breasted Bronze birds for his customers this year. As a matter of fact, it might be hard for him to get out of the turkey business, because many of his customers leave standing orders from year to year and expect him to produce a bird of the right weight and proportions when they call for it.

He is bothered by the high

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Sea Isle City, New Jersey, July, 1948

price of feed, of course, but on the other hand, he does himself a big favor by growing all the corn he needs for his turkeys. One of the comments about McCleary during Farmers' Week was that you could go to his farm in the spring when nearly everyone else was out of corn, and you could find his crib full.

McCleary manages to keep the turkey ranges fairly close to the house. He rotates ranges, keeping the turkeys at the back of the house one year and on the side the next. A couple of poles on each range are equipped with wires and 500-watt lights so that whichever range is in use can be well lighted all night.

Tomatoes, peppers, onions, and sweet corn are other mainstays at the McCleary place. Usually he has about 15 acres of oats for turkey feed. Tomato yield is double what it was when McCleary bought the farm. Membership in the Ten-Ton Club is no novelty, and last year he boosted his yield to 16 tons.

That was fine, but he had to pay out so much for labor that he's not sure, now, whether he was working for the pickers or they for him. Then, too, he spent additional money on dust to keep the blight away. He was thinking of switching some of his tomato acreage to sweet corn, but he could see danger there, too, especially in the marketing end.

To see those stretches of green you'd never guess that this was a sick farm 15 years ago. Lime and organic matter supplied most of the cure, together with whatever chemical fertilizers were needed to bring a crop along. McCleary started putting on a ton to the acre of ground limestone every three years. To restore the texture of the soil he planted soybeans, crimson clover and wheat, and spread hundreds of tons of wool waste.

"Wool waste?" you say. It turned out that I shouldn't have been surprised at mention of wool waste in any county near Philadelphia, because farmers have been using it for years to provide organic matter. It's combings from wool which accumulate in textile mills. McCleary has been trucking it from North Philadelphia a long time, spreads it at the rate of six tons to the acre. He gets it free, but figures his trucking expense makes it cost around $6 a ton by the time he gets it to his farm.

Besides fluffing up the soil, the wool adds a moderate amount of nitrogen. The only trouble is, says McCleary, when he uses such waste he has to be extra careful about keeping down the weeds that grow from the seeds tangled in the combings.

Crimson clover and wheat are used as covers, and, soybeans are plowed down to further enrich

the soil. McCleary also likes to plow under his sweet corn stalks while they are still green. He usually plants his soybeans in late August, lets them stand until just before they begin to make pods, and then plows them down.

McCleary buys horse and cow manure, too, whenever he can. He gets some from the three cows he keeps—mostly for convenience—and the team of mules which comes in handy at times to supplement tractor power.

Alfalfa for the livestock comes from a couple of fields near the house—the ones that are used also for turkey ranges. John explained that while turkeys are on one of the ranges, he has corn growing on the other. Then in late summer he harvests the corn and sows alfalfa. The first cutting of alfalfa the next year goes into the barn and the turkeys harvest the rest. The birds also do a good job of cleaning corn borers and other insect pests off the range.

Once in a while McCleary takes a flyer in something besides turkeys and the vegetables mentioned. He looks back, for instance, on the year he cleared $1,000 on an acre of cantaloupes. Another year a similar venture finished in the red.

The McClearys raise their own pork which they have cured and frozen. And with their garden, about 75 by 200 feet, they manage to be pretty self-sufficient. It takes three lockers in nearby Pitman to hold the frozen fruits and vegetables Mrs. McCleary and her daughter process. Even the family garden yields a little cash income. Last year surplus lima beans alone brought in an extra $40.

Better Protein, More Oil in Your Corn

Condensed from Farm Science

G. F. Sprague

Corn that is higher in oil, corn with a better balance of protein—that's something farmers can look forward to. The new improvements will be useful. But they're not as spectacular as they sound. Higher oil content, better proteins can't be seen in the field or in the crib. Farmers are apt to be disappointed if they expect too much.

In many ways the development

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of high-oil and better-protein corn is like the development of waxy corn. But the improvements will help everybody, not just specialized growers for a limited market.

For the plant breeder, the job is much slower and more complicated than in the case of waxy corn.

Neither one of these improvements will cause much change in the use of corn. But they will make corn more useful both for livestock and for industrial uses. Obviously corn with better protein will have higher feeding value. And within limits higher oil content, too, will make corn better feed. The oil in corn also has value in industrial uses.

A lot has been said and written about high protein corn. We know that we can boost the overall protein content considerably. But the real value of high protein in corn has not been established as yet. The results of such developments may be misleading. They may not increase feed value very much.

Here's why. Proteins are complex organic compounds; they are made up of simpler nutrients called amino acids. Some of these amino acids are essential to normal growth and development. Others are not. As far as we know, proteins from various food sources differ in the number and the amount of these amino acids that they contain. If all of them are present in the proportions needed for normal growth and development, we call it a balanced protein. If one or more of the essential amino acids are lacking, the protein is deficient. Then we have to make up the deficiency by using some sort of a protein concentrate feed to supplement our ration.

The protein in corn comes from two general areas within the corn kernel. The protein found in the germ area (center portion) is balanced; whereas the endosperm protein (found in outer areas) is not as well balanced. Protein from these outer areas seems to be lacking in both tryptophane and lysine—two of the amino acids that are essential for animal growth.

From the research work already done, we know that we can increase the protein percentage in corn. But this may not be desirable for two reasons. First, there is an inverse relation between protein content and yield —as protein percentage goes up, yield declines. Second, the increase in protein percentage is made up mainly of a protein (zein) which has little or no feeding value.

Thus by breeding for a high protein corn, we might increase the percentage of protein in corn considerably over a period of years. But after doing this our corn might have no more value

as livestock feed than the regular corn varieties we are feeding to our animals today.

We will gain more by working for a better balance of the protein components instead. By improving the protein balance—selecting for more of the useful protein components, less of the components that lack nutritional value—we can actually improve the feeding value of corn without changing the total protein content. This, we believe, is a more useful goal to work for in our plant breeding.

Ten to fifteen percent of the Iowa corn crop is sold. A small portion of this is used by "wet-milling" industries. Wet-milling is the process that gives us cornstarch, corn sugar, adhesives and other corn by-products. One of these by-products is corn oil. Another is the protein concentrates that are left over after the starch is taken out. These protein concentrates usually go back to the farm in the form of high protein feeds.

Pound for pound the corn oil that comes out of this extraction process is worth 4 to 5 times as much as the starch. It would seem like a good thing then, if we could develop corn with a higher proportion of oil.

This is possible. In our experimental plots at the Agronomy Farm we have some corn that yields as high as 12 percent oil. The average for ordinary field corn is about 4.5 percent. Given enough time, we can go even higher than 12 percent. We know that we can—but there is a practical limit which will determine the highest oil percentage that is desirable in corn.

It may not be good business to go beyond 8 to 12 percent oil in corn. First of all, if our oil percentage got too high the starch manufacturers would have to redesign a lot of their extracting machinery.

And there is another practical limit to the amount of oil in corn. It comes in when you're feeding livestock. We don't have any experimental data on the effect of feeding corn oil to livestock. We do have some on the use of soybean oil, however. And there is every reason to expect that results would be somewhat the same.

Hogs, for instance, develop "soft pork" when we feed them more than 8 percent soybean oil in their ration. A corn with more than 8 percent oil would very likely give us this same problem. Then hogs fed on such corn would take the same discount that hogs fed on peanuts often take because of "soft pork." The quality of the pork would be reduced. It wouldn't pay to feed the high oil corn alone. High oil corn would have to be mixed with other feeds to keep total

oil content of the ration down to a certain level—about 8 percent.

As far as we know, the margin is a little higher in the case of cattle. Dairy cattle especially seem to make good use of soybean oil in the production of butterfat. Everything considered, however, it doesn't seem advisable to try to develop the percentage of oil in corn beyond 8 or 12 percent.

High oil corn (8 to 12 percent) is still a few years away from commercial production. But we are far enough along to know that it can be produced on a general scale. In our experimental breeding work, we find that crossing a high yielding corn with a low yielding corn gives offspring that yield somewhere between the two parents.

We already have one line of corn that produces 12 percent oil. If we cross our regular seed stock with these high yielding strains, we may expect to get corn that contains about 8 percent oil. At this level our corn will be more useful in the wet-milling industries. And it will be better feed for livestock too. But beyond this point it does not seem economical to go at the present.

Another thing we must not forget is a possible effect on yield. We have found no relation between yields and oil content within the range of oil percentage we've worked up to so far. But it is very possible that a cut in over-all yield would set in if we go much higher in oil percentage.

It may take more energy for a plant to produce oil than it does to produce starch. If this is true, any particular hybrid might produce less total yield as soon as its oil content got very high.

The introduction of better protein strains into our present commercial varieties is more difficult than in the case of high oils. In terms of protein content, the offspring of a cross is not so apt to yield an average of the two parents. It tends to be more like the low protein parent instead. This means a lot more breeding and a lot more selection in order to get a better protein hybrid.

Ordinary corn will usually run from 2.5 to 5.5 percent oil (4.5 percent is average). By careful selection and crossing we can raise the average oil yield of our inbred without much trouble over a few years.

In the case of protein the technique is the same but the results are much slower. In the first place, our means of measuring the more useful protein components is not very accurate. Second, there is such a small quantity of these amino acids in corn that any significant improvement comes very slowly. Average corn runs from about .084 to .124 percent tryptophane (one of the

amino acids we are measuring for).

Such improvements as these will be important to farmers and manufacturers in the long run. They will mean a corn that is more valuable for livestock feed and for industrial uses. But you probably won't be able to see the difference in the feedlot. The improvements will not be as spectacular as they sound.

The Agriculture Remount Service

Condensed from The Horse

THE bill, providing for the transfer of the Remount Service to the Department of Agriculture, passed the House of Representatives on June 16, 1947. It was finally passed by the Senate on April 8, 1948, was approved by the President on April 21, 1948, and thus became Public Law 494. Briefly, the Act provides for the transfer of the records, property, including stallions, broodmares and foals, real estate and civilian personnel of the Army Remount Service to the Department of Agriculture, effective July 1, 1948, from which date the Army Remount Service, after a quarter century of outstanding service to the horse breeders and users of the Nation, ceases to exist as an Army organization.

No doubt the many thousands of persons in every Section of the country who have been cognizant of the fine work of the Army Remount Service will regret the necessity for the transfer. But there was no alternative. Many of us, as a matter of fact, may feel keenly that abolishment of horse calvary in the Army was a mistake. That is now beside the point. The important thing to keep in mind is that the action of the Congress and the willingness of the Department of Agriculture to take over the Remount Service have resulted in saving the Army Horse Breeding Plan from liquidation, thereby making the Remount stallions still available to breeders at a modest service fee.

Immediately after the passage by the Senate of H.R. 3484 the American Remount Association requested information from the Secretary of Agriculture as to the set-up that the Remount Service would have after transfer. The

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reply of the Secretary, the Honorable Clinton P. Anderson, follows and is self-explanatory.

The Agriculture Remount Service

The Army Remount Service which is transferred from the Department of the Army to the Department of Agriculture under the provisions of an Act of Congress approved April 21, 1948 (Public Law 494, Eightieth Congress, 2nd Session), will be known as the *Agriculture Remount Service,* and constitute a separate organizational unit within the *Agricultural Research Administration.* The breeding program will be supervised by a small unit in Washington and will be carried on through the four field installations heretofore maintained by the Department of the Army at Front Royal, Virginia; Fort Reno, Oklahoma; Fort Robinson, Nebraska; and Pomona, California. The area headquarters previously directing and supervising the assignment of stallions to eligible agents for breeding were reduced to four in number by the War Department in June 1947, and are now operated from the four breeding stations.

It is proposed, initially at least, to follow a plan of operation similar to that followed by the Department of the Army. That is, all stallions presently available and those becoming available from time to time, except for the few needed at the field stations, will be assigned to eligible agents located in the area served by each station. Each agent will be authorized to breed the stallion assigned to him to his own mares and to those of other owners in his community at a fee not to exceed a stipulated sum. The present maximum fee is $20. Fees are presently authorized to be retained by the agent as compensation for maintaining the stallion under specified conditions as to quarters and care.

As rapidly as possible, the Service will develop and document a long range breeding program in order to assure the required degree of continuity in breeding operations. Each of the breeding stations will maintain a band of brood mares and stallions consistent with the size of the station and its facilities and in accordance with the needs of the area which it serves.

It will be the aim to breed stallions which will be of such quality as to give reasonable assurance of the production of the kind and types of light horses which will meet the requirements of farmers, ranchers, and others in the area to be served by each stallion. This does not mean breeding research will be carried on, as reliance will be placed on the results of research conducted by the Bureau

of Animal Industry and State agricultural experiment stations. Methods will be devised for testing the merits of stallions at any early age so that when used for breeding on the station or placed in the hands of agents for breeding, there may be some assurance as to the kind of progeny that will result.

To the extent possible, all stallions used in the program will be foaled, raised, and trained at the breeding stations. Stallions will be purchased only as needed to provide new blood. The Agriculture Remount Service will be directed toward the development of horses for utilitarian purposes on the farms and ranches of the country. No effort will be given to the production of horses for specific use for show purposes, for use in racing, or as polo ponies.

Science Helps Livestock

Condensed from the California Cultivator

Jerry Sotola

FARMERS are always alert to new discoveries which lead to more efficient production with the saving of labor in these days of narrowing profit margins. The mechanization of the farms with an increase of tractors from a quarter million in 1920 to 2,250,000 by 1946, has released 55,000,000 acres of crop land for the production of food which formerly was used to produce feed for horses and mules.

During this interval the man-hours of labor per acre of a given group has been reduced by one-half to two-thirds. However, there has been only a slight reduction in man-hours in the production of hay crops, and very little saving in labor in the production of livestock.

Therefore, a keen interest in labor-saving devices is evidenced by the livestockmen. Feed is blown directly from grinders into self-feeders; water is being piped directly to the fields; mechanical grain unloaders are becoming prominent; and self-feeders are being installed. The power manure scoop and mechanical barn cleaners are becoming popular. The livestock feeders have learned the hard way that the proper arrangement of building and feed storage bins can save a lot of steps in man-hours of high-priced labor. Many feed lots are being re-arranged so that all feeding

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can be done from the outside without opening any gates.

Surveys by agricultural colleges made only recently show that there is a large variation between the more efficient and less efficient farmers as far as feeding practices of livestock are concerned. For instance, efficient cattle feeders have produced 100 per cent beef with 33 per cent less grain than the feeder can who did not supplement properly in the ration of his fattening cattle. In a survey of some 430 dairy farms, the more efficient upper third could produce 1000 pounds of milk with the saving of 35 per cent grain in comparison to the lower third. On about 800 hog farms 100 pounds of pork was produced with the saving of 100 pounds of grain. This means that the better hog men have saved 4–3/10 bushels of corn on every hog they marketed in contrast to their less skilled fellow farmers. In general, the better livestock men have gained a 25 per cent higher return for every $100 worth of feed than those who fed by guess.

The spring season makes pasture ready and its judicious use is the back-bone of economic livestock production. Good pastures, properly grazed, produce nutrients similar to those found in milk when the comparisons are made on a dry-matter basis; assuming the soil to be fairly fertile.

The early spring grass may lack substance. It is quite watery and quite high in potassium. For this reason, animals crave salt because they need it in order to get rid of the potassium salts contained in the young grass. The watery material of the grass in early spring detracts from its feeding value because the cow grazing 150 pounds of this succulent feed may be taking in only 15 pounds of dry matter. This dry matter, however, is of similar composition as the dry matter found in common grains. As the season advances, the grasses become more fibrous, become lower in moisture content, and a cow consuming 150 pounds of grass may be taking in 30 pounds or even more of dry matter.

There is a close connection between rain and the ability of the cattle to digest pasture grasses since rain makes the grass more tender, less fibrous, and higher in protein.

Close grazing means a reduction in the leaf surface. Therefore, the wise cattleman grazes early spring pasture lightly because a sharp reduction in the leaf surface may hurt the potential producing capacity of that pasture.

The newer concept of feeding cattle is based upon a better understanding of what goes on in the paunch. This large sack which is sometimes called the rumen, has a volume capacity of 30 to 40

gallons or even much more than that in larger cattle. It is a veritable vitamin laboratory. This segment of the alimentary canal is inhabited by numerous bacteria and other microscopic organisms belonging to the plant and animal kingdom.

The paunch of the cattle is the place where the fibrous material is digested. This is accomplished through digestive enzymes produced by the microscopic organisms and the problem becomes quite acute with the advancing season when the pastures become dry and woody. Supplements of soybean cake, or linseed or cottonseed meal, in amounts of ¼ pound to ½ pound, or even up to 1 pound have been given to range cattle on dried-up ranges with remarkable success. Apparently such supplementary feeding acts as a stimulant to the micro-organisms of the paunch.

Besides digesting fiber, the micro-organisms build up a lot of the vitamins which belong to the B-complex group, the most important of which are thiamin, riboflavin and nicotinic acid. These vitamins in turn may result in better appetite and the practical cow-man can tell you that when cattle are fed supplementary protein feeds they always eat more of the dry grass than when no supplement is given.

Within the paunch of cattle the digestion of fiber is accompanied by the release of numerous organic chemical compounds, among which are the phenols. These in turn tie up phosphorus and they exert a paralyzing effect upon the digestive ferments and depress the digestibility of the entire ration. For this reason, dried-up ranges are best utilized when the supplementary feed contains some protein and some phosphate.

Green grasses are rich in numerous plant pigments. The most notable of these from the livestock feeding standpoint being the carotenes—the one designated as Beta-carotene is the mother substance of vitamin A. As pasture grasses become dry, these pigments disappear and the cattle grazing parched dried pastures are coasting on their vitamin A reserves which have been built up in the liver during the lush grass season of the spring. However, during blizzards, drouths, etc., supplementary feed may be necessary and there is no better source of carotene than dehydrated alfalfa meal. Supplementary feed, using molasses as a binder, containing the proteins of the oil meals and some phosphates, either as a disodium-phosphate or a good grade of sterilized bone meal, should make an ideal combination for the maximum stimulation of the rumen-microflora and should insure the greatest well-being of the cattle, and the maximum utilization of the dried-up range.

A Protein Feed Stretcher

Condensed from Capper's Farmer

UREA is a synthetic chemical compound of two-fold interest to agriculture. It is used both in cattle feed and fertilizer. As a fertilizer it supplies nitrogen. As a feed it can be substituted for a part of the protein needs of cattle.

Animal nutritionists and feed manufacturers gave urea a lot of attention during the war when protein supplies were short. Its chief advantage as a feed is that it contains nitrogen which the digestive machinery of cattle, sheep, and goats can change to protein. Urea has no energy value in itself, but bacteria in the rumen build the nitrogen into proteins which are digested by the animal. Only ruminants have a digestive system than can handle the urea nitrogen.

Urea has been tested both in dairy and beef cattle rations. At Wisconsin Experiment Station milk production in a Holstein herd was practically the same when urea was substituted for linseed oil meal. Urea had no unfavorable effect on breeding, health of calves, or quality of milk.

The station found that urea should not make up over 3 percent of the concentrate mixture in the ration. More than 3 percent may injure the animal's kidneys. In dairy sections where homegrown grains are available. Wisconsin station suggests that protein requirements may be supplied by adding 3 pounds of urea to 97 pounds of grain.

Yearling heifers and pregnant cows were successfully wintered on dry native grass and urea pellets at the Oklahoma Experiment Station. Pellets, containing 25 percent urea nitrogen, consisted of 75 percent cottonseed meal, 4 percent urea, 11 percent hominy feed and 10 percent blackstrap molasses. Bulls, wintered on urea pellets and grain and hay remained thrifty. Feedlot steers fed alfalfa meal and urea made as good gains as those on alfalfa meal alone at the Nebraska station.

Urea-treated sorghum silage made a palatable feed at the Mississippi Experiment Station. Mature cows wintered as well on a daily ration of 35 pounds of treated silage and 5 pounds of Johnson grass hay as they did on 30 pounds of untreated silage, 1 pound of cottonseed meal and 5

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pounds of hay. Yearling heifers gained on a winter ration of urea-treated silage and hay. The heifers ate 5 pounds more treated silage daily than they did of the straight silage.

The treated silage was made by adding 10 pounds of urea to a ton of chopped sorghum as it was blown into the silo. Urea treated silage contained 10 percent less moisture and 41 percent more protein than the untreated feed.

Most urea fed thus far has been in commercial feed mixtures. Extent of its use will depend upon protein supplies and its price in comparison with other protein feeds. Because ruminants only can use it as food, the Association of American Feed Control Officials has agreed that it is acceptable in feeds for cattle, sheep and goats only. The association has also agreed that the amount of urea in the feed mixture should not exceed 3 percent of the grain ration.

May Get Corn Rootworms Chemically

Encouraging indications that corn rootworms may be controlled with benzene hexachloride are coming from tests at Nebraska Experiment Station. This chemical kills lice and mange on hogs.

Rootworms infest most of Nebraska's corn area and are particularly bad in irrigated lands. They also appear in other corn-growing states. Second-year corn on irrigated land in Nebraska was damaged up to 50 bushels an acre in 1946.

Growers combat rootworm damage by growing hybrids that recover quickly. Nitrogen applications also give plants vigor to overcome damage to roots. Listing instead of surface planting, fall tillage and timely irrigation are other preventatives. The most practical control method where infestation is heavy is to grow corn 1 year and alternate with another crop.

Benzene hexachloride was applied both as a spray and a dust in the Nebraska tests. The spray was put on top of the ground shortly before planting time and dust was applied as a side dressing at the first cultivation. Altho the chemical kills rootworm larvae, entomologists do not yet recommend its use because they have not determined what its effect will be upon the soil or soil bacteria or whether it will be absorbed by the plant sufficiently to spoil corn for food or feed.

DDT also killed the adult rootworms in the Nebraska tests, but until it is found what effect the poison remaining on the leaves may have on livestock that eat them, recommendations on its use will not be made.

—Capper's Farmer

Prime Feed at Low Cost

Condensed from Soil Conservation

Winnett J. Fite

PASTURE is the cheapest feed that can be grown on the farm for forage-consuming livestock. Figures collected by the United States Department of Agriculture in 16 States show that each 100 pounds of digestible nutrients obtained from pasture cost 64 cents. In contrast, the same data place cost of digestible nutrients per hundred pounds of alfalfa hay at 83 cents, of corn at $1.38 and of oats at $2.02. In Utah, the experiment station found that high-producing, irrigated lands produced 246 pounds of butterfat per acre in pasture, but only 215 pounds of butterfat when in alfalfa. Barley produced 144 pounds of butterfat and oats 98.

An example of the difference in cost between feed produced in an irrigated pasture and feed produced in a grain or hay field appears in the results of a survey made in southern Idaho at the Idaho Experiment Station. Feed costs of producing a pound of butter averaged 20 cents over the entire year, but only 8 cents while the cows were on pasture.

In addition to being cheaper, pasture is a better balanced food, high in protein, minerals and vitamins. Besides all these advantages, pasture requires no cultivation or harvesting. Faced with these striking facts, certainly southwestern farmers—and many others, too—can use more pasture, and better pasture, to make their livestock more profitable.

Good pastures seldom just happen. They must be carefully planned, planted, and managed. Given equal care in planning, preparing the soil, planting, and managing as that accorded cash crops, a pasture will return dividends in extra production. Pasture can be grown on our best land and will provide income comparable, if not higher, than other crops over a period of years, at less cost for labor and equipment, and added improvement in the physical condition and fertility of the soil. Much land not now suitable for other crop production can be made to produce profitably in pasture.

The livestock-carrying capacity can usually be increased on a

Reprinted from Soil Conservation, Washington, D. C., June, 1948

farm that is adequately irrigated, by establishing a mixed grass-legume pasture. Such a pasture can be fitted into most farm programs by arranging to produce any additional hay and grain needed for the additional livestock at times of year when the pasture cannot be grazed, or by using steers or some other class of livestock that can be marketed at the end of the pasture season.

Aside from factors of climate, soil, and irrigation, the grazing capacity of an irrigated pasture depends upon its plant species and the kind of management it receives.

Ranchmen in range livestock areas are increasingly recognizing the value of irrigated pastures for use during periods when livestock are not on the range. Some of them are finding such pastures profitable as the sole grazing areas for beef cattle. Irrigated pastures used to supplement native ranges make it possible to manage the latter conservatively and thus to increase livestock production. Where an irrigated pasture is available for early spring grazing, spring use of perennial native-grass range can be delayed. This results in greater yield of the native grasses.

A cow will eat her fill in a couple of hours or less on a pasture supporting a vigorous growth of herbage, but on an overgrazed pasture a large amount of energy which should go into milk production is expended in search for grass.

A cow will consume 100 to 150 pounds of green herbage each day if available, but on a closely grazed pasture this is impossible. It is obvious, therefore, that the deficiency must be made up by feeding hay.

On ordinary fertile land, unfertilized, the yield of green herbage at the beginning of the season will be around 400 to 500 pounds to the acre. But if the pastures are rotated 20 to 25 days later, the peak growth will reach 1,200 to 1,500 pounds.

In deciding on an irrigated pasture program, the grazing needs of the livestock and the capabilities of the land are considered jointly, and in relation to the over-all economy of the farm or ranch operation. Grazing needs depend upon the kind and number of livestock to be kept on the farm, as well as the type of livestock management. The land capabilities depend upon soil, slope, degree of erosion, presence of alkali, height of water table, and similar factors. Land capability maps prepared by the Soil Conservation Service are the basis for sound conservation farm planning. Help in such planning is obtained by farmers from soil conservation districts. When grazing needs and land capabilities have been determined, provisions are

made in the farm conservation plan for the acreage of pasture required, its location, the rotation of pasture crops with other crops, and any special land-management practices needed to produce pasture crops and conserve soil.

The dense ground cover of a well-managed stand of pasture plants prevents soil erosion on sloping lands, and the dense root systems improve the structure of the soil and increase its capacity to absorb water. Grass roots, particularly, are effective in improving soil structure because of their volume, density, and fibrous character. They have a binding effect on light soils and a loosening effect on heavy soils, both of which contribute to tilth, permeability, and resistance to erosion. The organic matter contributed to the soil by grass roots decomposes more slowly than that contributed by roots of legumes or by annual green-manure crops. Combination of rapidly decomposing legume roots, which have a high protein content, with slowly decomposing grass roots results in prolonged benefit. Maintaining a balance of grasses and legumes leads to high sustained production of crops grown after the pasture stand is plowed under.

Soil improvement progresses most rapidly during the first few years of a stand of pasture plants. Later, it tends to level off. In general, therefore, the way to take full advantage of the soil-improving capacity of pasture crops is to rotate such crops with others in regular sequence.

Two or three grasses plus one or two legumes are usually an adequate number of species for the pasture mixture. Using a greater number of species seldom adds any value to the mixture, and complicates seeding and management.

Grass species differ as to seasons of flush growth, dormancy, and near dormancy. Some grasses grow most rapidly during the cool weather of early spring and others during the warm weather of late spring and summer. Species that grow rapidly in cool weather are desirable for use on areas where irrigation water for pasture use is available only in fall or early spring. Where water is available in spring and summer, grass species having different seasonal growth periods should be selected for use in mixture, so that the pasture, under good management, may produce the most uniform possible yield of high-quality forage throughout the grazing season.

Legumes are valuable in the pasture mixture in that they (1) contribute substantially to volume growth, especially during spring and summer, (2) are richer in protein and certain minerals than the grasses, (3) give variety to the

forage and, being highly palatable, contribute to high-volume consumption of forage and thus to high animal gains, and (4) if inoculated, take part with soil bacteria in fixation of nitrogen from the air, reduce the need for applying nitrogen to the pasture as fertilizer, and increase the amount of nitrogen available in the soil to crops used in rotation with the pasture mixture. Legumes should make up at least 30 percent and not more than 50 percent of the number of plants in the pasture stand. If constituting more than 50 percent, they may create serious danger of bloat.

Each plant species to be used in establishing an irrigated pasture should be selected for its adaptation to the climatic and site conditions, its grazing qualities, and its seasonal rate of production.

In general, grasses and legumes are adapted to wide ranges of soil and other site conditions. Deep-rooted legumes are not adapted to shallow soil, or to soil having a high water table. Both grasses and legumes vary in their adaptation to wet, poorly drained soils and to alkaline soils, and only species of known tolerance should be included in mixtures seeded on such soils. Mixtures to be used on very sandy soils should include deep-rooted legumes and sod-forming grasses.

A well-managed pasture affords an ideal use for sloping areas of erodible soil that cannot be leveled to nonerodible grades. As irrigated pastures, such areas become permanently productive. Livestock production is a suitable use, also, for the best of irrigated farm land. Good pasture is profitable wherever livestock is kept. It is a crop that improves the land while it is producing. It can be handled with a minimum of cost, and it walks off the land when harvested.

Sheep—Man's Best Friend in Greece

Condensed from Foreign Agriculture

Dr. C. S. Stephanides

FROM Biblical times sheep have made a great contribution to man in the way of food and clothing. This was especially true in the "old countries," where a man's wealth was measured by the number of sheep he had. Today in some Near Eastern countries sheep raising is the leading industry. In Greece, for example, sheep supply milk, milk products, and meat for food; wool for clothing and shelter; and skins for containers of cheese, wine, olive oil, and other liquids.

This branch of the livestock industry is well adapted to the topography and climatic conditions of Greece and contributes an important part of the total agricultural income. In 1937, the sheep industry accounted for 18.7 percent of the total income from livestock, whereas in value it represented more than 24.1 percent of the total livestock industry. In 1938, sheep supplied 46.6 percent of the total milk production and 47.2 percent of the meat production. Calculated on the basis of fat content, however, milk from sheep accounts for much more of the total milk output, since it tests from 6.0 to 7.5 percent fat.

Sheep are raised in Greece primarily for milk; meat and wool are of secondary importance. Lambs for meat are slaughtered when they are from 6 to 8 weeks old, and those that are kept for replacements are weaned very early so as to save as much milk as possible. Of the total income from sheep, nearly half is derived from milk and milk products, the breakdown on a percentage basis being as follows:

	Percent
Milk and milk products	45.10
Mutton	14.26
Lamb	24.77
Wool	8.68
Hides	7.19
Total	100.00

The greater part of the milk is used for cheese, more than 75 percent being used for soft white and the remainder for hard cheese. Of the total cheese and butter output in Greece from all kinds of milk, sheep account for about 68 percent of the soft cheese, 63 percent of the hard cheese, and 36 percent of the butter (table 1).

Reprinted from Foreign Agriculture, Washington, D. C., July, 1948

TABLE 1.—*Production of specified dairy products in Greece, by classes of livestock, average 1936–37*

Classes of livestock	Soft white cheese	Hard cheese	Butter
	short tons	*short tons*	*short tons*
Cows	1,554	239	1,416
Water buffaloes	468	15	686
Sheep	36,578	9,075	2,014
Goats	14,930	5,111	1,402
Total	53,530	14,440	5,518

Production costs are much lower for sheep's than for cow's milk, because sheep seldom receive any feed other than that derived from pastures too poor for grazing cows. Were it not for the cheap draft power provided by oxen and cows, the Greek farmers would probably confine themselves wholly to sheep raising.

The raising of sheep is carried on in four different ways in Greece, which are briefly described as follows: (1) Nomadic, traversing great distances; (2) seminomadic, moving within a comparatively small area; (3) settled in villages, but depending on pasture; and (4) stabled at home, and depending mainly on fodder, produced by owner or bought.

The nomads—Sarakatsanes, Vlachs, Karakounidou (Albanian Vlachs)—and a few natives follow the purely nomadic practices, similar to those of Biblical times. They have no permanent settlement but with their families and household equipment follow their flocks from pasture to pasture. Only in very rare cases, when weather conditions are too bad for the animals to graze, do they feed any concentrates.

Plato, Homer, and Aristotle described the life of the nomads of their time, and it does not differ from that of the nomads of today. In search of pasture for their flocks, they move toward the end of May to the mountains where they live all summer. In October they return to the plains where, owing to fall rains, the vegetation is green. They live mostly in tents that are made from the wool of their sheep, although they sometimes build temporary huts from brush or branches of trees. For centuries their mode of nomadic living has continued and has so established itself in the lives, customs, and habits of the people that it is hard to break it down.

In their simple day-to-day living, the nomad's needs are limited to a very few items, such as buttons, needles, thread, matches, salt, olive oil, and a few cooking utensils. Almost all their clothing and bedding are made at home from the wool of the sheep.

Every nomad has a few pack animals, such as horses and mules, which are used to transport his household effects, tents, children, and old women who are unable to travel afoot over the long, hard

mountain trails. Illiteracy is high among these people. The women seldom know even how to sign their names, and the men rarely have a chance to complete the fourth grade of grammar school.

The families vary in number from 15 to 45, depending on composition and structure. The compound system prevails among them. The oldest member acts as the head of the group and handles all economic transactions and apportions the income, as well as the work, to the other members. They respect him and have great faith in his judgment and wisdom.

The second type of husbandmen, the seminomads, have permanent settlements, either on the plains or in the mountains. They follow their flocks to pasture but do not travel so far as the nomads and depend only in part upon grazing as feed for their sheep. Their families seldom travel with the flocks. They represent a transition stage from the nomadic to a semipastoral way of life.

The sheep enterprise carried on in settled villages—the third type of husbandry—marks an improvement over the nomadic and seminomadic types. In this, the people cultivate crops and raise draft animals. Some of the family devote their time to livestock raising and others attend to crops. Although their flocks depend largely on pasturage and on forest products, such as acorns, chestnuts, and leaves, they also receive additional feed—mostly grown on the farm.

Under the fourth, and most advanced, type of sheep husbandry the animals are stabled and are usually of improved strains. The products obtained from these sheep—wool, meat, and milk—are of better quality and in greater volume than those from the sheep raised under nomadic conditions. This type of husbandry is usually located in sections where fruit and vegetable growing is the chief agricultural enterprise, and the sheep are fed the byproducts of the gardens and orchards, as well as some concentrates.

The pasture area in Greece decreased from 1922 to 1937, during which period 1,500,000 refugees came into the country and had to be resettled on the land. During the same period, however, the sheep population increased from about 6,000,000 to 8,500,000. The small landowners, especially those in mountainous areas, had found that a small investment in sheep enabled them to make a better living. Sheep were preferred to other animals, because they contributed more to the family needs.

Despite the increasing numbers, the sheep population was still not large enough to meet the needs of the country for meat, and imports were necessary. In 1935, Greece

imported almost 918,000 sheep. Cattle furnish a part of the meat supply, but numbers have always been relatively small, accounting for only about 24 percent of the domestic meat consumption.

Greek sheep, like those usually found elsewhere on the Balkan Peninsula, belong to the class having a narrow, long tail and wool mixed with hair. This class is thought to have originated from the trans-Caspian sheep of the steppes, *Ovis vignei*, introduced from Asia Minor. The different types in Greece today were originally of the Zackel class, according to Adametz, but have developed their present characteristics as the result of topography, climate, and care and management practices.

Variations in size, quality of wool, productiveness, color, etc., exist among Greek sheep, but there are certain general characterisics that apply to all in one degree or another. The small development of the skeleton; narrow body; short but strong legs, well-fitted for long journeys; the ability to feed on poor roughage, to withstand hardship; and early maturity are common features.

The different breeds are named after the regions in which they are raised. While not pronounced, the characteristics they have acquired in addition to the features common to all are distinct enough to distinguish one breed from another. The leading breeds are the sheep of Crete, Zakynthos, Lefkimi, Scopelos, Katafygion, Thrace, Serres, Karamanikon, Chios, Argos, and Metelini.

Of the 11 leading breeds, 7 are island sheep. They are quite different from the mainland sheep and produce many times as much milk, meat, and wool. These island breeds vary in number, according to the size of the islands. As a rule, the total per island is small, ranging from a few hundred to only a few thousand.

The isolation of the islands from the mainland and the uncertainty of feed supplies from the outside have contributed to the improvement of the island breeds. The island farmers are usually poor, and they cannot afford to keep many, or inferior, animals on their small holdings; thus, through centuries of intensive selection they have developed superior sheep, not only from the standpoint of milk, meat, and wool production but also from that of fertility. It is not unusual for these breeds to have twins and triplets. The bulk of their feed consists of byproducts from vegetable gardens and orchards, with some vetch hay and horsebeans.

Sheep improvement has been hampered in Greece by lack of

organized breeding and inadequate Government control over the classification and establishment of pure breeds. Also, the pastures upon which the animals are so largely dependent for feed have not been improved since Homeric times. Continuous grazing and increased pressure of the livestock population on the same areas prevent the reseeding of legumes and grasses, and the pastures are near exhaustion.

Shelters for the sheep are usually crude and provide little protection from cold winds and winter rains. The crowding of the animals into open, muddy quarters encourages the spread of internal and external parasites, and estimates indicate that 10 percent of the sheep and goat populations are lost each year as a direct, or indirect, result of this practice.

Veterinary service is also inadequate. The Government takes special measures to combat disease only when the death rate reaches epidemic proportions. Neither individuals nor communities take any preventive steps against disease or parasites. Because of the common pasturing system, communal action is indispensable for effective control.

Yearly milk production varies among the different breeds of sheep from 20 to 250 quarts. This variation is attributed to differences in feeding habits, the origin of the animals, climate, topography, and care and management practices. Thus, possibilities are great for increasing the milk, meat, and wool production of the native breeds through selection, better feeding, improved shelters, and disease and parasite controls.

The sheep industry of Greece could not only become a greater source of income to the farmer and the nomad but could also add to the national income if certain measures that are within the means and the ability of the livestock people and of the Government were to be adopted, such as: (1) Improvement of breeds through selection, with better feeding and care; (2) rotational pasturing, fertilization, and in some cases reseeding of pastures; (3) construction of better shelters, suitable to local conditions; (4) the feeding of concentrates during winter months in order to maintain the health and vigor of the animals, which is always low after the lambing period as a result of inadequate feed; (5) eradication campaigns by community and state against disease and parasites to reduce yearly losses in animals and animal products; and (6) utilization of a small portion of the tax collected from livestock owners to improve breeds and better the health of the sheep and other livestock.

The Story of Nitrogen Fertilizer

Condensed from the Fertilizer Review

IT WAS from the distant plateaus of Chile that farmers obtained their first supplies of commercial nitrogen for growing more abundant crops. But within a few years a new and progressively larger source of this plant food was to be obtained close at hand.

The German chemist, Justus von Liebig and the English scientist John Bennett Lawes, working in the 1840's laid the foundation for obtaining nitrogen in a new form. Despite the importance of commercial nitrogen to farmers, the first industrial production of this plant food came as the result of the ingenious recognition of the value of the by-products of the steel industry.

The owners of coke ovens near St. Denis, France, were the pioneers in this process. They reasoned, logically, that coal is nothing but prehistoric vegetable matter "cooked down" and squeezed to hardness through millions of years. They thought the basic chemical properties of the trees and plants were probably still present. In 1858 they proved it when they built the first retorts to reclaim ammonia as a by-product of the coking process. From then on it was a simple matter of running the ammonia gas through a sulphuric acid bath to obtain the nitrogen-rich crystals of ammonium sulfate.

Today this legacy of prehistorically modern wealth from the coal pits to the land to the consumer is one of the largest by-products of the American steel industry. Approximately 21 pounds of ammonium sulphate are obtained from every ton of coal processed for coke in steel plants and their subsidiaries. By 1939 this process had reached an output of 580,274 tons per year, according to the U. S. Bureau of Plant Industry. Then, as the flames of war swept across Europe both steel and the land were called on for unparalleled production, and in 1944, coke ovens produced 818,244 tons of this plant food.

A modern coking plant is like nothing more than a huge loaf of bread, cast in steel and brick. Some of the plants are a mile and a half long. Each "slice" of the loaf is a separate oven, holding a charge of 16 to 20 tons of bituminous coal. These ovens are charged by electric mules running along the top of the structure.

Reprinted from the Fertilizer Review, Washington, D. C., May-June, 1947

The coal is cooked by bases obtained as a by-product from previous coking operations.

The ammonia gas given off by the process passes on to batteries of vessels filled with a dilute of sulphuric acid. The gas bubbles through the acid and solidifies into small crystals, no larger than a grain of sand. Scooped out of the crystallizers, the sulphate of ammonia is "whirl-dried" in a centrifuge machine, then passed on to a rotating kiln-dryer to emerge as a clean, free-running plant food carrier that is approximately 21 per cent pure nitrogen.

After many millions of years, the lush plant life of the Carboniferous Era gives back its nourishment to Twentieth Century health and productivity.

Turn Atomic Energy on Corn

Atomic energy has been turned on pollen cells of sweet corn at the Nebraska Experiment Station in a search for ways to use this great force in crop improvement. Factors in the cells which control color and form of the grain apparently got a terrific shock, and ears resulting from use of the irradiated pollen looked like Joseph's coat of many hues.

The Nebraska experiment is one of several in which atomic energy is being used in agricultural research. Nebraska scientists took the tassels from cornstalks just before the pollen was ready to fall and sent them by plane to the atomic pile (oven) for irradiation with uranium neutrons. Pollen exposed for various lengths of time was dusted on the silks and produced grain that varied in color and form from normal grain of the variety.

Scientists say research in this field is purely exploratory. They are hunting for practical ways of causing changes in the plants that may make them more valuable. Such changes are called mutations.

Another phase of agricultural research with atomic energy is the use of radioactive forms of chemical elements called isotopes. By placing radioactive phosphorus in the soil, for example, the movement of phosphates from the soil into and thru the plant may be traced. The isotopes give off radiations, or rays, which are detected with special instruments. Feeding habits of insects may be studied also thru use of radioactive materials in their food.

—Capper's Farmer

Folic Acid—Newest B Vitamin

Condensed from Farm Research

M. L. Scott
Ithaca

THE discovery, isolation, and synthesis of the newest B vitamin, folic acid, has been heralded as one of the great achievements in the field of nutrition. Much of the research work leading to this achievement was performed in the poultry departments of the agricultural experiment stations throughout the country.

Research work intended to improve poultry feeding has not only resulted in helping the poultryman to produce more eggs per hen per year, but also has given a great deal of valuable information concerning certain diseases of man previously thought to be incurable but now known to be caused by faulty diets. Among the diseases that have responded to treatment with vitamins of the B complex are beri-beri, which is caused by a lack of vitamin B_1, and pellagra, which responds to treatment with another B vitamin called niacin.

Although folic acid does not appear to be the whole answer, its discovery has opened the door in the search for the causes of two more dread human diseases, pernicious anemia and sprue.

In 1938 research workers in the Poultry Department at Ithaca made the discovery that chicks would not grow unless their feed contained an unknown vitamin. Almost simultaneously, a group of research men in California reported the same thing. Several feeds were tested, and it was found that dried brewers' yeast, liver and green plants were excellent sources of the vitamin. At the University of Missouri in 1940 it was found that this vitamin was not only required for chick growth but for the prevention of anemia as well. Soon, many research laboratories took up the work, and found that the vitamin is required by all forms of life, from the monkey to the lowly bacteria. Bacteriologists at the University of Texas extracted the vitamin from spinach, and named it *folic acid* because they thought it was present in largest amounts in green foliage.

In 1943 the yellow crystalline acid was isolated from liver by two different research groups, one

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at the Lederle Laboratories, Pearl River, New York, and the other at Parke, Davis and Company, Detroit, Michigan.

Finally, in 1945, its chemical structure was determined, and folic acid was produced synthetically by the Lederle Laboratories.

Subsequent studies with the pure synthetic vitamin bore out the earlier findings that this substance was a potent growth factor and antianemic agent for chicks. Studies with turkey poults showed that this animal became paralyzed when its diet did not contain enough folic acid. At Ithaca it was found, however, that poultrymen need not worry about folic acid in their poultry feeds. When good ingredients are used to supply other nutrients they also appear to supply plenty of folic acid.

When folic acid was shown to be concerned in blood formation in the chick and other animals, several clinical investigators decided to try its effect upon some of their severest cases of human anemia.

The results were startling. Folic acid was found to correct the anemias of sprue, and pernicious anemia. It improved the blood condition in many cases of pregnancy where anemia had developed. It even caused new blood cells to form in anemic babies. Diseases that had previously responded only to unknown substances in extracts from liver were now being corrected by the feeding of this new vitamin.

However, these medical men proceeded cautiously. They were not satisfied to accept this new cure on the basis of a few preliminary tests. They had to know how this new vitamin would stand the test of time.

In most cases it seemed to prove satisfactory in all respects. On the other hand, some patients with the worst anemia of all, pernicious anemia, were cured as far as the blood condition was concerned, but developed other symptoms of the disease, such as numbness and tingling in the fingers and toes and a partial loss of use of the arms and legs. This condition, caused by a lack of function of certain nerves, did not respond to folic acid treatment and could be cleared up only by treatment with liver extract.

With the discovery of folic acid, a new weapon has been unearthed to aid in the constant war against disease. However, with the discovery and use of this new vitamin, new questions have arisen. Why does folic acid do as good a job of curing the anemia of pernicious anemia as does liver extract, but fail to cure the nerve disorder associated with this disease? Why does the turkey become paralyzed when it doesn't

receive enough folic acid while the chick does not show this symptom under the same conditions?

An understanding of the answers to these questions and others that will arise as studies of these problems progress will give more fundamental information to help even more in the battle against disease.

Hormone May Boost Pig Production

Skilled use of sex hormones in hogs offers a possibility of bringing more pork to American dinner tables and of easing the multiple problems of swine production at the same time, according to a report in a national veterinary journal.

Dr. L. M. Hutchings of Purdue University, writing in the Journal of the American Veterinary Medical Association, said this hormone technique was developed by Professors H. H. Cole and E. H. Hughes of the University of California.

Injection of the hormone, equine gonadotropin, into sows after the fortieth day of lactation shortened as much as two to four weeks the period between successive farrowings Dr. Hutchings stated.

In addition to shortening the farrowing season, use of the hormone would allow greater lifetime production per breeding animal—at least one extra litter per sow—provided farmers could adjust their feeding and management schedules to meet the stepped-up production program.

Effectiveness of the hormone is attributed to its marked stimulating action on the ovaries. In the hands of experts, it was over 95 per cent efficient in bringing about desired results, the writer said.

—*Hog Breeder*

Hormones for Tomatoes and Other Vegetables

Condensed from Texas Farming and Citriculture

E. Olshanky

USE of hormones to set tomato blossoms, increase yields, and promote earlier ripening of fruits has been under investigation by a growing list of Agriculutral Experiment Stations, Universities, canners, and growers. In the past year results obtained in these tests have shown increases of well over 25% in total crop yields through the use of these materials.

In Florida, the Everglades Experiment Station carried out a series of tests on tomatoes in the winter of 1947–1948. The use of a commercially available product, No-Seed hormone, in these tests produced yield increases of 27% to 29%. A preliminary report obtained from the Experiment Station observed that the average temperatures were warmer than usual during the growth period of the tomatoes under test. The report further noted that the growing season for these tomatoes was entirely unfavorable for a good crop yield, as will be noted in the figures given below. Two varieties of tomatoes were used in the tests. Grothen's Globe and Rutgers. The experiments were replicated fifteen times. The yields reported in the following table are for No. 1 tomatoes only; all others were eliminated.

Hormone Treatment	Yields per acre	
	Grothen's Globe	Rutgers
None	5645 lbs.	4256 lbs.
NO-SEED Hormone .	7188 lbs.	5490 lbs.
% Yield Increase ...	27.2%	29.0%

The preliminary report from the Experiment Station noted that, had the usual cool night temperatures prevailed, the yield differences would undoubtedly have been greater. It has been well-known that hormones function particularly well in setting fruit when night temperatures are lower than the optimum temperature for normal fruit-set. The report of the Florida Experiment Station is excellent indication of the effectiveness of hormones in setting blossoms when the temperatures are on the high side.

Similar experiments were carried out by the Experiment Station at Ft. Collins, Colorado, in the 1947 summer season. Here again a considerable increase in yield was obtained through the use of the hormone as a spray on

Reprinted by permission from Texas Farming and Citriculture, Harlingen, Texas, May, 1948

the blossoms. The Colorado report remarked on the larger size and superior quality of the treated fruits. It further commented on the number of seedless tomatoes which resulted from the treatment.

The fact that these hormones produce seedless tomatoes is of limited value; although to some people this is quite important. The real significance of hormone application lies in two major facts:

1) Hormone treatment produces earlier tomatoes.

2) Hormone treatment produces greater yields.

Both of these facts are important to the grower and the canner. To the market gardener the value of earlier tomatoes is obvious; he can sell more tomatoes early in the season and get the high prices which early tomatoes command, thus getting the maximum profit from his crop. To the canner, earlier ripening offers the prospect of spreading the canning season. Large scale treatment of tomato crops could well enable canning operations to start a week or two earlier. This spreads the season, relieves peak loads at the factories, and could result in saving many tomatoes which often spoil while waiting in line for delivery at the factory.

The advantage of greater yields also needs little comment. More tons per acre means more profit per acre. And the meatier, better-tasting tomatoes which result from hormone treatment assures the grower a high-price market for practically his entire crop.

Application of hormones is decidedly economical. Any sprayer which can be set to give a fine mist may be used. The mist-type spray is most effective and most economical because it employs only a minimum amount of solution. Sprayers are available which will effectively mist, or fog, a full acre with as little as 5 or 10 gallons of spray solution, either from the air or the ground. For smaller operations, knapsack or wheelbarrow sprayers, or even the ordinary household fly sprayer, may be used.

A single application applied when the first blossom cluster is approximately 75% to 90% open will produce highly profitable results. For even greater results, two more applications at about ten day intervals should be made. The spray should be applied so that a fine mist envelopes the blossom cluster. When using NO-SEED hormone it is not necessary to confine the spray only to the blossoms. If the spray hits other parts of the plant, there will be no adverse effects. It is necessary, however, that some of the spray does come in contact with the blossoms.

Much the same results are ob-

tained on peppers, cucumbers, egg-plant, and squash. When used on strawberries, raspberries, other types of berries, and on beans, it sets the blossoms and increases the yields considerably. In time new applications of these hormones will be found. Meanwhile, the grower will profit greatly by applying these hormone materials to his crops for more and better crops.

Cattle Feeding Gate Cuts Labor Costs

One of the principal ways in which farmers can hope to cut production costs is by devising labor shortcuts. Not much can be done by any individual about the price of machinery, the cost of fertilizer or the amount of taxes he pays. But in many cases he can figure out ways to reduce his labor costs.

For nearly two years we have been experimenting at the Mazur Farm, near Lambertville, with ways of reducing the amount of labor needed to carry beef cattle through the barn feeding season. If beef cattle raising is to be profitable in the East it must be done with a minimum of labor.

By feeding chopped hay through specially devised feeding gates we were able to put 30 tons of hay through 25 Hereford steers last winter with less than three man hours of labor. The feeding period lasted 5½ months, but the amount of man labor required was almost nothing.

The main problem in the self-feeding of chopped hay is to keep it coming down the chutes or hoppers. It has a tendency to bridge over. The gate, which was designed by Robert Barnhart, manager of the Mazur Farm, in cooperation with our Agricultural Engineering Department, solves this. It is made of 2×2's, hinged at the top. As the cattle push their heads through the gate to get at the hay, the hay above is agitated and prevented from forming a bridge.

These feeding experiments have been carried out in specially-constructed self-feeder barns.

Plans for future work on this project call for the erection of a 90-ton Quonset-type barn which will be equipped with hay curing apparatus, self feeders and the feeding gates described above. Our objective is to develop a barn into which chopped hay can be blown and cured and which will then take care of a herd of cattle during the winter with little or no labor.

Our experience during the past year and a half indicates that this project is entirely feasible.

—N. J. Farm & Garden

Cash Value of Turkey Manure

Condensed from the Turkey World

G. T. Klein
Massachusetts State College

TURKEYS and chickens produce about twice as many pounds of fresh or wet manure as the dry feed they eat. That totals about 200 pounds from a 20-pound market turkey, and nearly 500 pounds from a breeding tom kept for a full year.

Turkey manure varies in its analysis slightly. These figures from Pennsylvania State College give an approximate analysis.

Moisture	74	Percent
Nitrogen	1.31	"
Phosphoric Acid	.71	"
Potash	.49	"

This is nearly three times as high in nitrogen as horse manure, twice as high in phosphoric acid, and the same in potash.

The amount of plant foods contained in turkey manure is considerable. A flock of 1,000 birds grown to market age would void manure containing more than a ton of nitrogen, ½ ton of phosphoric acid, and 800 pounds of potash.

We often hear that poultry and turkey manure "burns" plants. Vegetable gardening folks at the University of Massachusetts point out that the most widely used commercial fertilizer contains 5 percent nitrogen, 8 percent phosphoric acid, and 7 percent potash. They cite the much greater chance for the commerical product to burn plants than turkey manure. It is all in knowing how to use it on different crops.

Because of the highly commercialized nature of the turkey and poultry industries in Massachusetts and the large quantities of manure produced on these farms, studies were made by various departments of the University to determine the best use.

It was realized from the beginning that turkey manure is lacking in both phosphoric acid and in potash in comparison to the ratios in which they are present in the popular 5–8–7 garden fertilizer. The use of two well-known commercial products, 0–20–20 or 0–14–14, was at once suggested by University investigators.

Here is a table giving comparative yields of four extensively

Reprinted by permission from the Turkey World, Mt. Morris, Illinois, April, 1948

grown truck and garden crops when the land was treated with manure, commercial fertilizers, and combinations of the two.

While these experiments were in progress, rainfall occurred in sufficient quantity so that almost ideal growing conditions prevailed. When you have such conditions, these experiments indicate to me that poultry manure or turkey manure, which has about the same composition, will produce satisfactory crops and without injury to the plants.

In brief, here is what the experiments showed:

1. The greatest yield of tomatoes was obtained from 5 tons of poultry manure, supplemented with 500 pounds of 5–8–7.

2. The greatest yield of sweet corn came from the use of 5 tons of poultry manure and 1,000 pounds of 0–20–20.

3. The above treatment gave the greatest yield of carrots.

4. The plots receiving 5–8–7 fertilizer at the rate of 1 ton per acre gave the greatest yield of cabbage, although the difference in yields between these plots and those receiving 10 tons of poultry manure was not highly significant.

Later, hothouse grown tomatoes at the University received applications of 20 tons per acre of poultry manure without signs of burning and injury. There was ample evidence of a satisfactory yield. This is an extremely heavy application.

In visiting dozens of turkey and poultry farms each year as I do, there is opportunity to see the results of applications of turkey manure to various crops. It takes no expert agronomist to tell that for some crops, particularly clover, field and sweet corn, that the addition of phosphoric acid and potash would be helpful. Clover leaves often have a characteristic yellow color showing lack of these ingredients. Corn, with an over-supply of nitrogen, grows too rank and has difficulty in forming and maturing grain. Probably the addition of 500 pounds of 0–14–14, plus a fairly heavy application of turkey manure to the acre, is a good way to use it.

Other departments at the University of Massachusetts have carried on experiments with poultry and turkey manures, and all got favorable results. Here are brief summaries of recommendations of experts in these fields.

Vegetables—All crops, with the possible exceptions of peppers, tomatoes and potatoes, will do well with applications of 5 or 6 tons to the acre.

Pastures and Crops—Entirely satisfactory, although it should be supplemented with phosphoric acid and potash for clover. Turkey

manure contains some of the less common minerals which are now considered valuable for crops.

Lawns and Golf Courses—One of the best of plant foods for grass growth. Apply in the fall and winter in as large quantities as the eyes will stand. Objectionable from the standpoint of weed seed. If burning occurs, plants will recover from it quickly.

Fruits and Berries—Useful when applied in moderate amounts in early spring or late fall after growth has stopped. Few orchardists use too much. Especially valuable for strawberries when applied before plants are set.

Flowers—When spaded under in the spring, poultry manure can be used at a reasonably heavy rate for both annuals and perennials.

The loss in plant food from turkey manure when exposed to considerable rain is large. The sooner it can be applied to fields, the more value is saved. *Additions of lime or acid phosphate, used to hasten drying, hold flies under control, and to make odors less objectionable, does not increase the loss of nitrogen.* In fact, it helps to preserve the plant food and adds beneficial minerals.

Floor litter, from pens which have housed turkeys for considerable lengths of time, is valuable and not objectionable or harmful to use in the ways mentioned. It is worth half to two-thirds as much as the straight dropping, depending upon the length of time it has been in the house.

The vegetable gardener or flower grower often likes to compost the turkey manure. This is easy to do and has the advantage of decomposing leaves, weeds and refuse quickly. It is well, however, to supplement the manure with the commercial fertilizer. The compost would contain these ingredients. Layer of leaves, weeds and refuse (1 foot); a layer of turkey manure and fertilizer (4

Crops Lbs.	Plot	1 ton 5–8–7	5 tons poultry manure	10 tons poultry manure	5 tons poultry manure + 1,000 lbs. 0–20–20	5 tons poultry manure + 500 lbs. 5–8–7	16 tons horse manure
Tomatoes	1	162	141	161	132	159	110
	2	167	202	166	104	196	136
	Av.	164.5	171.5	163.5	118	177.5	123
Sweet Corn	1	120	93	131	129	99	119
	2	100	137	98	141	122	125
	Av.	110.0	115.0	114.5	135.0	110.5	122.0
Cabbage	1	284	251	300	277	268	220
	2	320	294	291	271	283	261
	Av.	302	272.5	295.5	274.0	275.5	240.5
Carrots	1	194	198	191	200	197	199
	2	241	221	223	238	231	223
	Av.	217.5	209.5	207	219	214	211

to 6 inches); a layer of soil (6 inches).

If the compost is approximately one year old, it is ready for use on any crops or plants, including the most delicate flowers.

I have made extensive use of turkey and poultry manure in growing flowers, a number of berries, almost every garden crop, and on the lawn. It has given excellent results, particularly when supplemented with commercial materials.

Weedless First Cutting of Alfalfa

We got a peek at some new seeded alfalfa on the Wesley Brendler place out of Modesto the other day. Vic Osterli of the Modesto farm advisor's office had been carrying on some weed control experiment in this stand.

The sprayed portion of the field looked like it was headed for a first cutting of the highest quality rabbit hay. This spraying of alfalfa, both young and old stands, is going to be standard procedure some day.

In this case the experiments were with three to five pints of dinitro weed killer in 75 gallons of water per acre. If the spraying is done when the alfalfa is in its first tri-foliate leaf and the weeds are tender, the three pints of material do an excellent job.

This stand had been infested with fiddle neck, mustard, chickweed, radish, and star thistle. At a cost of about 70 cents a pint for the spray material the expense was a cinch to be offset by a handsome profit on the fine quality first cutting.

Vic is going to make a seedling count which it is possible may show that the initial rate of seeding of alfalfa may be cut down if weeds are controlled from the start. This may be an additional saving to more than offset the cost of spraying.

In experiments at Davis, a sprayed plot produced 1950 pounds of No. 1 alfalfa hay in the first cutting. An unsprayed plot of the same size produced 460 pounds of hay and it was 74 percent weeds.

—California Farmer

Quail—A Cash Crop

Condensed from The Cattleman

Rosemary McDonnell Scales

RECENT national surveys report that sportsmen are paying approximately $4,000,000,000 annually for hunting and fishing expenses. The farmer or rancher can cash in on a share of this sum if he has game on his land.

Wildlife can be cultivated and harvested like any other crop while the same land is used for grazing or producing agricultural crops. Thus, game can be a valuable by-product of the chief use of the land.

There are several ways of making money from a single type of game. Consider quail. The landowner who has a good quail crop can lease hunting privileges, rights to train birds dogs, or both, to a single hunter or to a group of sportsmen if his acreage is sufficient. He can lease to professional handlers of bird dogs who need grounds to train dogs for participation in field trails. In a cooperative plan with neighbors, he can lease these rights to a club of sportsmen.

The cultivation of quail is a phase of the use of land which has been neglected widely; however, it has been done successfully under widely varied circumstances. The procedure is essentially the same, regardless of the acreage involved. The basic needs of quail for survival and increase are sufficient cover near an adequate supply of food, control of predatory animals and regulation of harvest by hunters. A program covering these requirements will yield good results at the end of the first year.

W. H. Meyers owns 320 acres of pasture and farm land in Kleberg County, Texas, on which he raises hegari, sorghum, maize, clover, Sudan grass and cotton. He wanted enough birds to provide good hunting for his four sons, so he began a program of quail culture in March, 1946, at which time he had nine birds.

First he built nineteen brush shelters at the borders of the grain fields to add to the natural cover offered in his 39 acres of brush. Clover and weeds were planted and allowed to grow up along the fences. The first winter Mr. Meyers fed his birds about 300 pounds of hegari. Since then he has put out a little clover and

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hegari at times when natural feed such as weed and grass seeds and insects was scarce.

Mr. Meyers now boasts of having three hundred birds on his land. No harvest of quail was permitted during the 1946–1947 season; however, three limits (totaling thirty-six birds) were shot during the 1947–1948 season. He believes the results are well worth the time, effort and cost involved; and he considers the cost was minimal because he himself raised all the feed used.

Besides having plenty of birds for harvesting, the program has resulted in other benefits. This past season Mr. Meyers noticed that his neighbors had more boll weevils than he did; and he thanks the quail for that. Grass in and around the brush shelters was able to mature to provide a natural reseeding of the pasture. Cactus allowed to grow up and support the fences has cut down vibration of the wires and prolonged the life of the fences.

Mr. Meyers says, "Every other farmer could do it if he wanted to. If I bought a piece of land that didn't have a bird on it, I'd buy a pair or two of breeding stock and start out from there." He is continuing his program and plans to add twelve brush shelters. Since his land already supports almost a maximum number of birds, the new shelters are primarily to keep the birds from moving away.

Any farmer or rancher who lives in basically good quail country can promote his quail to becoming a cash crop. Breeding stock will not need to be purchased for such natural quail country if any care is used to make the land attractive to quail. The mobility of quail is greater than was assumed for a long time, and birds will go where environmental conditions are most attractive. Land too poor to produce agricultural crops will still support quail while it is being restored to a crop-producing status; and many practices used to increase the number of quail are beneficial to the land. Whatever is done to increase quail also benefits the song and insectivorous birds.

The State Conservation Commission and the U. S. Fish and Wildlife Service will provide technical advice on problems having to do with game management. Another source of help is the Soil Conservation Service, which makes available seeds and shrubs best suitable to the locale. Outside assistance with predator control can be obtained from the Division of Predator and Rodent Control of the U. S. Fish and Wildlife Service as well as state conservation commissions and extension services of land-grant colleges. For maximum benefit from a program of predator eradication,

the co-operation of neighbors should be enlisted to spread the effects over a wide area.

When the quail crop has been built up enough to warrant hunting on the land, the owner will be wise to limit the harvest of his birds. The harvest should not be quite as great as the annual crop to insure against unpredictable factors affecting the increase of quail. The owner should insist that breeding stock for the next year be allowed to survive in each covey.

To realize any cash return from his quail crop, the landowner must come to terms with the sportsman. Sportsmen are well aware of the dwindling supply of birds and realize that the day of "free hunting" has passed. They know that conservation and propagation of quail require thought, time and effort. Hence, they are prepared to pay the landowner who is farsighted in the management of his game.

Two distinct types of hunters have emerged as a result of the scarcity of wildlife. The outlaw hunter has given the sport a bad name. He is the man who sneaks in to hunt without permission, who may leave gates open and shoot livestock or poultry. In contrast to him is the sportsman who is willing to pay for the privilege of hunting. He is a more desirable person with whom to deal because he respects the owner's rights and will accept responsibility. He will co-operate with the owner because he will want to return the following year on the same basis provided enough game is available.

By having his land leased to a reputable person, the owner can more easily refuse the privilege of hunting to others. Poaching is the joint responsibility of the landowner and the game department, and its effective control is dependent on close co-operation between the farmer and the game warden. Though the problem is not actually the responsibility of the sportsman who leases hunting rights, it is of paramount interest to him and his help can usually be enlisted when needed.

Although the farmer or rancher is in the key position to accomplish more than anyone in cultivating quail, sportsmen no longer expect the landowner to increase the number of birds without assistance. Bobwhite, Inc., is an organization of sportsmen throughout Texas who are trying to promote quail culture.

The club is acquiring land, by lease or purchase, to serve as breeding grounds. Surplus stock thus obtained is trapped off each winter and released on depleted areas just before the breeding season but after the hunting season has closed. The goal is to maintain enough birds to restock any suitable areas depleted by

over-hunting or natural causes. Another project of this club is the education of hunters to leave at least seven birds in each covey.

With these objectives (there are others, too) this relatively new organization may have a favorable influence on the future farmer-sportsmen relations.

The Bird Dog and Quail Club of San Antonio, Texas, has about 150 members. One of the club's purposes is to encourage and foster conservation and increase of game birds. This led in January, 1946, to sponsoring the Pandora Quail Management Project on about 8,000 acres of farm and ranch land in the eastern part of Wilson County.

The project is based on a three-way agreement for ten years between twenty-nine landowners, the Texas Game, Fish and Oyster Commission and the Bird Dog and Quail Club.

The landowners grant the agents and employees of the Texas Game, Fish, and Oyster Commission entrance on the property to conduct wildlife management to increase the number of quail. The Commission may also collect specimens needed for study purposes. The owners help protect and preserve quail on the area and will allow no hunting of quail on the property until birds have increased sufficiently. They permit the Bird Dog and Quail Club to conduct field trials for bird dogs on these grounds.

As part of the agreement, the Texas Game, Fish and Oyster Commission surveyed the property to determine the quail population and what improvements in habitat were needed to increase the number of quail. They also furnish any quail needed for restocking the area and consult the landowner on all plans for improvement of habitat or improved land use measures. No game management practices are conducted unless approved by the individual landowners.

The Bird Dog and Quail Club contributes funds needed for the project for such special purposes as the Commission is unable to make funds available. The club hires a special game warden during the hunting season and furnishes and sets out posted signs for the project area, for free access from one property to another, gates or fence gaps have been constructed by the club in accordance with the agreement to make such improvements in keeping with the existing type of fences. The individual landowner is promised payment for all damages to property or livestock that might result from field trials or quail censuses.

In the two years the project has been conducted the quail population has changed from about one bird for every 30 acres to approximately one quail for every 10

acres. The increase is due to a careful program of game management supervised by Robert G. Mauermann, a trained biologist appointed by the Game, Fish and Oyster Commission.

The program involves four main points. (1) Grasses are planted which are best adapted to the particular type of soil of the area and which benefit both quail and livestock. (2) Commercial fertilizers are used to promote re-establishment of native vegetation of the type beneficial to quail and livestock. (3) Unproductive eroded and waste areas are fenced for headquarters areas for quail and to check erosion. (4) The game management plans are coordinated with the Soil Conservation Service, the Agricultural Adjustment Administration and the County Agricultural Agents toward improved land use for maximum benefits to the land operator. All improvements are made at no cost to the landowner.

The cost of this project would have been prohibitive without governmental aid. Funds for quail restoration and management are provided by the U. S. Fish and Wildlife Service (75 percent) and the State Game Department (25 percent). The club must provide money for anything that involves purely club interests, such as building gates and improving courses for field trials.

The venture has already proved to be a success. The landowners are highly pleased. There are three times as many birds on the land as before, and the club held its first field trial there in March 1948. After the project has progressed through the research and developmental phases, it is hoped that it will be established permanently and maintained as a "Maintenance Project" by the Game Department and the U. S. Fish and Wildlife Service under provisions of the Pittman-Robertson Act.

The additional income to landowners who have conserved and increased their quail is sometimes appreciable. Frequently it is more than enough to pay taxes. For many years leased quail hunting rights on one 10,000 acre ranch in Goliad County, Texas, have brought the landowner $1,000 annually plus additional payments for privileges to train bird dogs and to hold field trials. Grazing land in Brooks County, Texas, regularly leases for ten cents to thirty-five cents an acre per year. Farmers owning relatively small areas, often 500 acres or less, in northern Colorado County, Texas, regularly receive payments of $100 or more per year for leases to Houston sportsmen. In Kleberg County, Texas, $200 was paid for one year's hunting rights on 320 acres. Payments on this scale or even greater are the rule in Mississippi, Geor-

gia, South Carolina, Florida and other states.

The area devoted to raising a crop of game is insignificant as compared to the total area of the farm. On an acreage basis, the cash return for the land used to raise quail is greater than the return per acre devoted to other crops. Furthermore, a good crop of game adds to the sales value of the land.

Sportsmen do spend money, time and effort for sport, and they will pay far more for game in the field than they will for similar meat in a market. Information and financial assistance for quail management on private lands are available, and landowners who pass up opportunities to grow crops of quail on their property, therefore, are failing to develop another and increasingly attractive source of income and enjoyment.

Chemical Control of Cattle Parasites

Condensed from Guernsey Breeders' Journal

A SYNERGISTIC insecticide, piperonyl butoxide and pyrethrins, developed by the Mellon Institute, may prove to be of considerable value to the herd owner for the control of many insects causing animal discomfort, if the results obtained at Mulhocaway Farm, Clinton, N. J., can be reproduced in other sections of the country. There are indications that they can be duplicated elsewhere, or adapted to other environments.

The chemical was first brought to the attention of the authors by Dr. Walter E. Dove, Baltimore entomologist, former Chief of the Division of Insects Affecting Man and Animals, U. S. D. A., whose early laboratory experimental work showed it to have quick action and residual values at reasonably low concentrations against a wide range of insect pests. Combined with this was a low toxicity hazard to man and animals. In laboratory tests, the concentrated solutions were found to be no more toxic to the test animals than the base oils used in making these solutions.

One phase of our work with this material has been with the control of blood-sucking flies attacking cattle on pasture. Preliminary work during the summer of 1946 gave evidence that this chemical might furnish a possible answer. In the first place, it was harmless to animals and man, and secondly, various dilutions in *water emulsion form* gave residual control. For the summer of 1947 it was decided to continue the experiments and, if possible, to develop dosages and methods of application which would be economical as to cost and at the same time would not disrupt established farm routines, and would control the flies attacking cattle on pasture.

During the summer of 1947, in northwestern Hunterdon County, N. J., the most numerous blood-sucking flies were horn flies, stable flies, greenheads, black horseflies, and deer flies.

The work can be divided into two parts: (1) the development, and (2) the proving. The Dodge & Olcott entomological research laboratory compounded a Pyrenone concentrate containing 100 milligrams of piperonyl but oxide and 10 milligrams of pyrethrins per cubic centimeter. One

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Peterborough, N. H., June 15, 1948

gallon of this concentrate was diluted with nine gallons of water to make 10 gallons of finished spray containing 10 milligrams of piperonyl butoxide and one milligram of pyrethrins per cubic centimeter. Four tests were run which showed (a) one pint of finished spray per animal was as efficient as one quart, (b) the first application lasted for five days, and successive applications to the same animals, when made in a continuous series, lasted for seven days. No special concessions were made to the tests. The animals were sprayed in stanchions while in the barn for milking. They were not held in the barn to allow the application to dry, nor were there any changes in grooming routines. For the purposes of these tests, the effectiveness of an application was considered terminated when six to 10 flies of all species were observed on any one animal. Fly counts were made in pasture at noon, Standard Time. During these tests, control (untreated) animals had patches of hornflies, probably several hundred individuals in the largest patches, and stable flies were numerous. The horsefly count did not average more than one fly per animal.

Fortunately, one of the tests occurred during a rainy week, six days of rain and one clear day, and another occurred in a week of six clear days and one rainy day. Neither set of conditions seemed to have any adverse effect, and this was confirmed in the second stage of the work. It is believed that the use of a quick-breaking emulsion aided materially in producing this result. In the concentrates, the emulsifiers comprised only 0.6 percent of the total.

For applying the spray, the equipment used consisted of Hudson Industrial sprayers equipped with five feet of oil-resistant hose and Spraying Systems T8001 nozzles attached directly to the shut-off valve. The procedure was as follows:

We batched 10 quarts of spray in the sprayers (one quart of concentrate and nine quarts of water). The pump section was affixed and the pressure built up to about 40 pounds. The sprayer was then shaken to mix the emulsion.

Standing at mid-section of the cow, the operator started (1) spraying at the tail head with fan-shaped spray pattern perpendicular to spine and swept forward to head, down side of neck and brisket, and front legs; (2) backward on side parallel to (1); (3) forward on side and part of belly; (4) stooping, swept up back of front leg, into leg pit, backward along belly, around udder, into hind leg pit and fold beside udder, and down front of hind leg; (5) stepped into aisle, *shook sprayer*, swept down rump

and escutcheon section and backs of hind legs. Stepping to the other side of the cow, the operator repeated motions (1), (2), (3), and (4); and (6) turning fan pattern forward and parallel to floor, sprayed top of head at horns.

To establish further the validity of our conclusions to this point, it was decided to add to the scope of our work, and to operate as if the procedures were on a commercial basis. The entire herd at Mulhocaway Farm, and herds at Spruce Run Farm, Clinton, N. J., Shady Brook Farm, Pittstown, N. J., and Hollow Hill Farm, Convent, N. J., were included. At Hollow Hill Farm, the herdsman applied the spray with a hand atomizer type of sprayer, giving each animal a light but complete coverage. This gave control to his satisfaction for two days. At Spruce Run Farm, one herd was out on pasture only from evening milking to morning milking. These animals were treated in the manner described in the above paragraph except that only the under half of the animal was sprayed, which required one-half pint of material. Results were comparable with those in other tests.

The results of this second phase verified the conclusions from the first tests, that is, five days' control on first applications, and seven days' control on reapplications.

Fly counts on animals in pasture were continued. It was not an uncommon occurrence to find only 50 to 60 stable flies, not more than one on an animal, no horn flies, and no horseflies on a herd of 91 cows. The greenhead and black horsefly would sometimes come in, level off for a landing, and then fly away, their mission frustrated. Since the purpose of the work was to keep animals free of flies, no study was made on the nature of the action of the insecticide on the flies. Flies which were on the animals at the time of spraying were killed. On pasture, flies were observed to drop off the animals to the ground.

During these tests, spraying operations were timed on several occasions. The average time for batching and applying spray did not exceed three minutes per cow. In some situations, the time factor was reduced to one and a half minutes per cow. The width of the stanchion seemed to have more influence on time required than any other physical factor.

With the milking herd of 91 cows, it was formerly the practice to apply an oil spray twice daily with a hand atomizer—once after the morning milking, and again in the afternoon before the second milking. About 15 minutes were allowed for each 40 cows. On this basis, the 91 cows would require approximately 35 minutes at each spraying. The last treatment of

the season, in mid-September, applied to this same herd, required three and a half man-hours, actual time for mixing and applying spray.

Using the estimated figure of three minutes per cow, a weekly saving in spraying time of 45 percent resulted. In other cases, depending on former practices, much larger time savings were shown. All agreed that there was no comparison in effectiveness; the precision method was far superior. It should be pointed out that spraying can become a weekly chore, not a daily grind.

There were no indications that there were any fluctuations in milk production due to the absence of flies. Tests to prove such a point would have to be highly controlled since milk production is influenced by a complexity of factors, of which fly infestation is only one small part.

Tests have been made by others in Minnesota and Nevada on the blood lost by cattle on range, due to one group of blood-sucking flies, the horseflies. On the basis of the infestations in those regions, it was estimated that an animal in Nevada lost approximately a quart of blood every 10 days, and in Minnesota the loss was a quart every three days. While the fly species and populations will vary from section to section, the loss of blood must still be considerable, and this blood must be replaced. Thus, part of the daily ration of a fly-infested cow must be diverted to replacing the blood consumed by insects. No studies were attempted which would determine body weight changes, since it has already been established that fly-free animals gain weight.

An immediately noticeable effect of all applications was reflected in the behavior of the cattle. Restlessness was eliminated. Milking cows stood quietly and were more easily and pleasantly milked. On pasture, the animals did not move from place to place to escape flies, nor did they toss their heads, lick and kick at themselves, or even switch their tails.

All of the animals adjusted themselves to spraying operations rapidly. Milking cows being accustomed to contact with human beings gave almost no trouble when sprayed while in their accustomed places, using the low pressure precision method. The spray produced felt to the hand like a cool, fine, gentle rain. At the first treatment not more than three or four matrons kicked when the legs and bellies were sprayed, but they were quite docile during subsequent applications. It should be noted that spray was not directed into the faces of the animals. Heifers which were on pasture continuously were uneasy during the

first application. With the second and subsequent applications they became increasingly cooperative, as though they had associated the procedure with some pleasant experience.

The heifers which had developed sores on the teats, and at the sides of the udders at the hair whorl, showed a marked improvement in their condition and, in many instances, a complete healing of these lesions due to absence of flies. Animals which did not have lesions at the beginning of the series of applications did not develop them. Animals sprayed weekly came into the full period without welts and sores on their necks, and around the bases of their tails and other portions of the body which cannot be reached by tail and tongue.

Because of its effectiveness as a control for blood-sucking flies, and its low toxicity factor in water emulsion form, it would appear that piperonyl butoxide with pyrethrins will assure greater animal comfort, and offers savings in spraying time, and possibly a reduction in feed costs.

Sell Your Berries On a Sunny Day

If you want to get the most for your strawberries, sell them on a sunny day. Female psychology, not vitamins, is the reason. Homemakers just don't buy strawberries if the sun isn't shining. But give them a chance in fair weather, and they'll clean the shelves.

That's what Louisiana State University marketing experts have found.

Louisiana berries go all over the country. Often they are on the road five days. If they arrive under gray or dripping skies, they may sell for less at their destination than they did at home.

Long-range weather forecasting, a network of teletype machines, and long experience, have taken part of the gamble out of the strawberry "deal."

Care in Marketing Livestock Cuts Meat Costs

Care in handling meat animals on their way to market is canny business as well as kindness. It can conserve the meat supply in a quantity which the ordinary consumer or producer does not realize, says the U. S. Department of Agriculture.

In 1947, according to figures compiled by the National Livestock Loss Prevention Board, the bruising of animals in transit—by rail and in truck—caused a loss of just short of 50 million pounds of meat. This was meat that had to be trimmed from slaughtered carcasses and discarded—pure waste. The net money loss, the Board estimates, was slightly less than 19 million dollars. Including stock dead, or crippled on arrival at market, the loss and waste figures mount to almost 70 million pounds of meat and just short of 25 million dollars. Directly or indirectly the farmers bear most of this loss.

These are facts back of the campaign to reduce such losses now being pushed by the Office for Food and Feed Conservation, which points out that this wasted meat would have given the average supply of 146 pounds of meat, to every man, woman and child in a city of 750,000. The meat loss represents a waste of from 4 to 6 million bushels of grain. (The average wheat crop of Iowa in recent years has been about 6½ million bushels.) This quantity of grain, says the OFFC, would have been enough to have supplied for a year the major food needs as grain of 700,000 underfed people in Europe or elsewhere.

Not all the waste can be prevented. Accidents will happen. But it can be reduced greatly by intelligence and care. It is estimated that about half the bruising occurs on farms and in loading for shipment. Nails, sharp corners, inadequate chutes and loading runways are important in causing wounds and bruises. Bedding with sand favors firm footing. Good partitions to separate animals in mixed loads; avoidance of overcrowding; slow loading; use of canvas slappers instead of clubs and canes to drive animals, are some of the ways recommended for reducing waste. Careful driving of trucks on curves, corners and hills, and frequent inspection of the loads will conserve meat that is needed, OFFC points out.

—*The Cattleman*

Recommended for The Farmer's Library

Beef Cattle Production in the South—By D. W. Williams, Head, Animal Husbandry Dept., A & M College of Texas. Interstate Printers & Publishers. $3.00.

Breeds of Livestock in America—By Henry W. Vaughan, formerly Prof. of Animal Husbandry, Iowa State College. Long's College Book Co. $4.75.

Dairy Cattle Feeding and Management—3rd Ed. By H. O. Henderson, Prof., Dairy Husbandry, W. Va. Univ., Carl W. Larson and Fred S. Putney. John Wiley & Sons, Inc. $5.00.

Dairy Science—By W. E. Petersen, Ph.D., Assoc. Prof., Dairy Husbandry, Univ. of Minn. J. B. Lippincott Co. $4.50.

The Horse of the Americas—By Robert Moorman Denhardt, Editor of Western Horseman; foreword by J. Frank Dobie. Univ. of Okla. Press. $5.00.

Management and Feeding of Sheep—By E. T. Baker. Orange Judd Publ. Co., Inc. $3.50.

Sheep Production—By Levi Jackson Horlacher, B.S.A., M.A., Asst. to Dean, Col. Agri., Univ. of Ky. McGraw-Hill Book Co., Inc. $4.50.

Animal Sanitation and Disease Control—By Dr. R. R. Dykstra, Dean, School of Vet. Med., Kansas State College. Interstate Printers & Publishers. $3.50.

Judging Dairy Cattle—By Edwin S. Harrison, Prof., Animal Husbandry, Cornell Univ. John Wiley and Sons, Inc. $3.00.

Livestock Judging Handbook—By Julius E. Nordby and W. Malcolm Beeson, Ph.D., Asst. Prof., Animal Husbandry, Univ. of Idaho. Interstate Printers. $3.25.

Livestock Production—By Walter H. Peters, Chief, Div. Animal and Poultry Husbandry, Univ. of Minn. McGraw-Hill Book Co., Inc. $4.00.

Hatchery Management—By Roland C. Hartman, Editor of Everybody's Poultry Magazine, and G. S. Vickers, Field Mgr. of Ohio Poultry Improvement Assn. Orange Judd Publ. Co., Inc. $4.00.

Profitable Poultry Keeping—By H. Clyde Knandel, Head, Poultry Husbandry Dept., Penn. State College. Orange Judd Publ. Co., Inc. $3.00.

Poultry: Science and Practice—By A. R. Winter, Asst. Prof., Poultry Husbandry, Ohio State Univ., and E. M. Funk, Asst. Prof., Poultry Husbandry, Mo. State Univ. J. B. Lippincott Co. $4.50.

Successful Poultry Management—By Morley A. Jull, Prof. and Head, Poultry Dept., Univ. of Md. McGraw-Hill Book Co., Inc. $3.50.

Commercial Poultry Farming—By T. Burr Charles, Poultry Husbandry Dept., Univ. of N. H., and Homer O. Stuart, Poultry Husbandry Dept., R. I. State College. Interstate Printers & Publishers. $4.50.

Diseases and Parasites of Poultry—3rd Ed. By Edgar Hugh Barger, D.V.M., and L. E. Card, Ph.D., Prof. Poultry Husbandry, Univ. of Ill. Lea & Febiger. $3.75.

Domestic Geese and Ducks—By Paul P. Ives, Pres., Am. Waterfowl Assn. Orange Judd Publ. Co., Inc. $3.50.

Raising Turkeys, Ducks, Geese, Game Birds—By Morley A. Jull, Prof. and Head, Poultry Dept., Univ. of Md. McGraw-Hill Book Co., Inc. $3.75.

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BOOKS OF INTEREST

MALABAR FARM — By Louis Bromfield, author, lecturer, farmer conservationist; illustrated by Kate Lord.

In this delightful and important new book you will learn more about life at "Pleasant Valley." This story of day-by-day labor and planning is told in Mr. Bromfield's convincing and colorful style so that the seeding of a field, the blossoming of a weedy hill, the development of a fine strain of cattle becomes exciting drama. About one third of the book is made up of extracts from the Malabar Journal, recording roughly a year's cycle of life at the Farm. Here is a heartening book that will give you an unequalled picture of accomplishment at Malabar—of country life as it can be and is lived. Let us send you a copy.

Publishers: Harper & Brothers — 405 pages — $3.75

COUNTRYMAN'S COMPANION — Collected and arranged by David B. Greenberg, author, farmer; decorations by Jack Wilson, artist.

Here is a treasury of farm literature from ancient to modern times, written to give you exciting reading and good counsel. The book is full of "farm life adventures, such as sheep raising in Montana, mowing hay in up-state New York, horse raising in the West, bee-keeping, stories on everything from earth-worms, beans, poultry and cattle, to axe-helves and threshing machines." The *Countryman's Companion* presents country life as an art, as a philosophy, and as a practical way of life. The hero of the pieces making up this collection is the dirt farmer. You will want a copy of this delightful volume. It will make an excellent gift for your neighbor.

Publishers: Harper & Brothers — 412 pages — $3.00

WILD FLOWER GUIDE — By Edgar T. Wherry, Professor of Botany at the University of Pennsylvania. Illustrated by Tabea Hoffmann.

The "Wild Flower Guide" for the northeastern and midland United States makes it easy to locate all important information about any wild flower you find, giving its common name, its scientific name, range and habitat, with suggestions for its culture. The book is beautifully illustrated in full color and in black and white. Over 500 species of American wild flowers are listed and organized for easy identification.

For those interested in Wild Flower Conservation practices on their country places in woodland, meadow or marsh, this will be a most helpful book.

Doubleday & Company, Inc. — 202 pages — $3.00

THE EARTH'S GREEN CARPET — By Louise E. Howard, author, and associate of Newnham College.

This is a short popular account of the ideas for a reformed agriculture which inspired the work of Sir Albert Howard, formerly Director of the Institute of Plant Industry at Indore, Agricultural Adviser to States in Central India and Rajputana, and author of "An Agricultural Testament." Lady Howard writes convincingly for those interested in human welfare and in the use made by man of the earth's rich mantle of verdure, the source of his food and of his raw materials, and without which mankind would vanish from the surface of the earth.

Rodale Press — 258 pages — $3.00

FOR WHAT AVAIL THE PLOW OR SAIL,
OR LAND, OR LIFE, IF FREEDOM FAIL!

—Emerson